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ROYAL BOTANIC GARDENS, KEW

LVI—TAXONOMY OF THE SUGAR-CANE SMUTS.

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The nomenclature of the smuts attacking species of the genera *Saccharum* and *Erianthus* is in confusion and attempts have been made to clarify the situation by Sydow (1924), Ciferri (1933) and Boedijn (1935). Sydow, after making a critical examination of the available specimens of smuts on these two genera, announced in 1924, that the name *Ustilago Sacchari* Rabenh. had been erroneously applied to the smut on sugarcane. *Ustilago Sacchari* is an ovariicolous smut with spores ranging in diameter from 7·5 to 10·5μ; it attacks the flowers of *Erianthus ravennae* Beauv. and was collected by Haussknecht at Marasch in Iran. Sydow, who re-examined the specimen, found that the spores were smooth, yellowish to bright yellow-brown, and that their diameter varied from 8·5 to 10·5μ. In selecting the specific epithet "*Sacchari*" Rabenhorst (1870) presumably had in mind the fact that some taxonomists had merged *Erianthus* into the genus *Saccharum*, but by doing so he introduced a confusion in the nomenclature of the sugarcane smuts which it has taken over half a century to clear up.

Further confusion was added by Fischer von Waldheim (1877) who stated that the spores were localized in the inflorescence and that their diameter was 10 to 12μ; he cited *Saccharum cylindricum* L. as an additional host but did not indicate the source of his material or its locality. It is apparent that he had not compared his specimen with Rabenhorst's type, for Fischer von Waldheim (1878) later discovered that he was actually dealing with *Ustilago Schweinfurthiana* Thümen [=*Sphacelotheca Schweinfurthiana* (Thüm.) Sacc.] and that the host itself had been transferred to *Imperata* as *I. cylindrica* (L.) Beauv.

Responsibility for complications in the nomenclature of sugarcane smuts should, however, rest largely with De Toni (1888) who monographed the *Ustilagineae* for Saccardo's "Sylloge Fungorum." He gave the range of spore size as 8 to 18μ, described the smut for the first time as culmicolous, added *Saccharum officinarum* L. to the list of hosts and cited Natal in South Africa, where J. M. Wood had collected sugarcane smut in 1881, as another locality. It is doubtful whether De Toni had actually seen this specimen, which is in Kew Herbarium, for the measurement of 200 spores has now yielded a

range of only 5·5 to 8·9μ, which is usual for sugarcane smuts and which comes nowhere near the range given by De Toni. Furthermore, he erroneously cited the type locality as Ravenna, a town in Italy, having apparently mistaken the specific epithet of the host plant, *Erianthus ravennae*, for the locality of the smut. It is surprising how an error once made persists, because even though pointed out by Sydow (1924) and again by Boedijn (1935), Ravenna is still cited by Ciferri (1938) as the type locality and he does not even mention Iran in its area of distribution.

The common sugarcane smut is culmicolous and entirely destroys the inflorescence. Its spores, according to Sydow, are dilute brown, smooth, and 5·5 to 7·5μ in diameter. He considered the smut, with every justification, to be different from *U. Sacchari* and named it *Ustilago scitaminea*. Another culmicolous smut on what was then known as *Saccharum fuscum* Roxb. [=*Sclerostachya fusca* (Roxb.) A. Camus] had also smooth spores, but a diameter of only 3·5 to 5·0, and he named it *U. consimilis*. Sydow said that he was able to distinguish a third culmicolous form on *S. spontaneum* L. whose spores were intermediate in size between those of *U. consimilis* and *U. scitaminea*, but he tentatively placed it in the latter species as the specimen with him, which like the rest came from India, was too poor to permit adequate description.

Additional complications to the *Saccharum* smut problem arose from the fact that Zundel (1930) confused *U. consimilis* and *U. scitaminea* and included the spore diameter and the host range of the latter in a description of the former and from Boedijn's (1935) statement that Rabenhorst had included *Saccharum officinarum* L. among the hosts of *U. Sacchari*, which he certainly had not.

The statement of Sydow that there may be a third culmicolous smut attacking the genus *Saccharum*, which was distinguishable by its size, led to a critical examination of the available collections of sugarcane smuts. A controversy with regard to the mode of transmission of this smut exists; Krüger and Wakker [as quoted by Dastur (1920)] in Java, and Ajrekar (1916) at Poona maintain that it can be transmitted by smearing the smut spores on the cut surfaces of the setts, while Butler (1918) and Dastur (1920) deny this, and the latter states that infection is only through thin-walled scale hairs of very young buds. Perhaps an explanation to these conflicting views lies in there being more than one species of sugarcane smut with different modes of transmission and it was hoped that this examination of the collections would reconcile these divergent views.

Materials.

Exsiccata material was obtained from several herbaria. Over thirty specimens were available in the Herb. Crypt. Ind. Orient. of the Imperial Agricultural Research Institute, New Delhi. Specimens were kindly sent by the Directors of the Royal Botanic Garden, Kew; Bureau of Science, Manila; Royal Botanic Garden,

Peradeniya ; and by Dr. K. B. Boedijn, Curator of the Herbarium Bogoriense, Buitenzorg ; Dr. D. H. Linder, Curator of the Farlow Herbarium ; Dr. F. J. Seaver, Curator of the New York Botanical Garden ; Dr. J. A. Stevenson, Senior Mycologist in charge of the Collections in the United States Department of Agriculture, and others. Within India itself, specimens have been received from the Mycologists of the Assam, Bombay, Burma, Punjab and United Provinces Departments of Agriculture. A large collection of sugarcane smuts was made in different localities and on different varieties of sugarcane by the staff of the Sugarcane Mycology Sub-Section of this Institute and was available for study, while Dr. B. L. Chona, in charge of that Sub-Section, suggested that a critical examination of the spores taken from the smutted plants of different ages and of collections from different cane varieties which had been artificially infected by the same smut collection would be worth while, materials of both of which he kindly supplied. The writer wishes to express his debt of gratitude to these persons for their kind co-operation.

In all cases, except when the material was very scanty, diameters of 200 spores mounted in lacto-phenol have been measured using artificial light from a 100-watt bulb. The light was filtered through a dilute solution of cotton blue which gave the effect of daylight. A Leitz fluorite oil immersion objective and 6+and 10+compensating eye-pieces were used, the former for the measurements.

Morphological Characters.

Several morphological characters of diagnostic value have been taken into consideration. The place of occurrence of a smut is of much significance, though a few ovaricolous or floricolous smuts like *U. Avenae* (Pers.) Jens. and *U. Tritici* (Pers.) Jens. have been known to assume a foliicolous character. The spores themselves, provided they are perfectly mature, show also a uniformity in the thickness of their spore-wall, in the character of their margin, in the markings of their surface and in their colour. These characters singly are scarcely sufficient to entitle a smut to specific rank, but taken together, they can, without hesitation, be used as characters of diagnostic value.

Spore-surface and Margin. The question has been sometimes raised whether such spore-wall characters as punctate, echinulate or verrucose markings can be relied upon in the separation of species and whether with the passage of time an echinulate spore is not likely to become punctate or smooth. In the course of the studies on smuts hundreds of specimens with echinulate spores, collected in different years, during about a century or more, have been examined. In no case has an instance been found where it was not possible to make out the echinulations clearly, if they had been reported to occur, provided the examination of the spores was made under an oil immersion objective.

Spore-size. With regard to size, it must be mentioned that nearly 400 species of *Ustilago* have been described and that their spore diameters range from 3·0 to 19·0 or 20·0μ, with means varying from 4·0 to 13·0 or 14·0μ. All these species have to be accommodated within these limits, which admitedly are very narrow. Equal emphasis should, therefore, be laid on the morphological characters and on the spore measurements in determining the species and an adequate number of spores, selected at random, should be measured. The smaller the number of spores measured, the greater the deviation from the true mean, and the measurement of at least 200 spores should alone be considered adequate in the smuts, although fewer measurements may have to suffice if the material is very scanty.

The Hosts. Agrostologists are not yet in accord regarding the status of the genus *Erianthus* Michx., and it has been merged by some of them into the genus *Saccharum* L., as the only distinction—that of awned upper glumes in *Erianthus* as against awned or awnless glumes in *Saccharum*—seems to break down. The genus for the present has been retained and the culmicolous smuts attacking *S. Barberi* Jesw., *S. fuscum*, *S. officinarum*, *S. spontaneum* and *E. ravennae* Beauv. have been included in the present communication. The host of *U. consimilis*, which, according to Mr. B. C. Basu, who collected it in Assam in 1910, is called "Ikra" grass and which was then identified at the Royal Botanic Garden, Calcutta, as *S. fuscum*, is so much damaged by the smut that it was not possible to re-determine it. Dr. N. L. Bor, an authority on Assam grasses, stated (in a personal communication) that the term "Ikra" is applied to a specially robust type of *S. spontaneum*. A smut collected in Assam in January 1938 on a host which was identified at the Royal Botanic Garden, Calcutta, as *Erianthus ravennae* is undoubtedly *U. consimilis*, but the identification of the host plant is a matter of some doubt as *E. ravennae* does not occur in Assam, according to Dr. Bor.

Results.

Seventy-three collections, fifty-two from India, eleven from the Philippines, three each from China and Java, two from Natal and one each from Burma and Mauritius, have been subjected to these critical tests. They can be divided on the basis of this examination into two species and two varieties, of which the latter are proposed as new. One of the new varieties has already been mentioned by Sydow (1924) as being intermediate between *U. consimilis* and *U. scitaminea*, but he did not describe it. This new variety attacks not only *S. spontaneum* but also *S. Barberi* and *S. officinarum* (both cultivated sugarcanes) and seems to be fairly common in Northern and Eastern India. The other new variety is characterised by its prominently echinulate and considerably large spores, averaging to 8·4μ or more in diameter and occurs chiefly in Eastern Asia (China and the Philippines) but one collection

has been made in India as well. The description of the two species has been emended for the sake of precision and clarity.

1. *Ustilago consimilis* Sydow.

Culmicolous, completely destroying the inflorescence and part of the axis ; sorus covered by the sheath, not extending into a long flagelliform structure ; vestiges of a membrane made up of host tissue and columella present. Spores black in mass, dusty, spherical to sub-globose, Chestnut (Ridgway), with thick spore-wall, smooth margin and spore-surface ; diameter from 3·7 to 6·2μ with a mean of 4·9μ.

On *Saccharum* ? *fuscum* Roxb. at Sibsagar, Assam ; collected by *B. C. Basu* on 18th December, 1910. A second collection was made in Assam in January 1938, on *E. ravennae* (L.) Beauv. by *T. N. Sen.*

Frequency of the spore-diameters of the type specimen (*Butler* 1412) is as follows :

Diameter μ	...	3·7	4	5	6	
Frequency n	...	7	13	150	30=200.	Mean=4·9μ.

2. *Ustilago scitaminea* Sydow.

Culmicolous, entirely destroying the floral axis ; sorus extending into a long, curved, flagelliform structure, at first covered by a delicate silvery membrane of host tissue, later naked ; lower part hidden by the leaf-sheath ; columella present. Spores powdery, black in mass, spherical to sub-globose, Rood's Brown to Prout's Brown (Ridgway), with thin spore-wall, smooth margin, very minutely punctate spore-surface ; diameter 5·5 to 9·7μ with a mean of 7·5μ.

On *Saccharum officinarum* L. and *S. Barberi* Jesw. in India, Java, Burma and South Africa.

Spore measurements of *Sydow's Fungi Exotici Exsiccati* 119 :

Diameter μ	...	5·7	6	7	8	9·2
Frequency n	...	8	31	145	74	32=290. Mean=7·3μ.

The total number of collections examined is forty-five and the spores have ranged in diameter from 5·4 to 9·6 with means from 7·3 to 7·9μ. This is the more common smut. Sydow's *Ustilagineen* 384 and 406, his *Fungi Exotici Exsiccati* 119 and *Raciborski* 22, are of this smut. All were issued as *U. Sacchari.*

Ustilago scitaminea *Syd.* var. **Sacchari-Barberi** *Mundkur*, var. nov. ; a typo differt sporis " Mummy Brown (Ridgway) ", 5·1–8·6 (in medio 6·7)μ, episporio crasso minutissime verruculoso, margine asperato.

On *Saccharum Barberi* Jesw. at Partabgarh ; collected by *B. B. Mundkur* on 11th March, 1934. Type of the variety deposited in the Herb. Crypt. Ind. Orient., New Delhi and Herb. of the Imperial Mycological Institute, Kew.

Spore measurements of type specimen :

Diameter μ	...	5·1	6	7	8	
Frequency n	...	3	90	104	3=200.	Mean=6·6μ.

Eight collections, collected at Amritsar, Karnal, Lyallpur, Partabgarh and Sepaya were from sugar-cane. One collection on the same host was made in Mauritius by *E. F. S. Shepherd* and was sent by the United States Department of Agriculture labelled *U. Sacchari*. Two were on *S. spontaneum*, collected by *E. J. Butler* at Pusa and Hoshangabad.

Ustilago scitaminea, *Syd.* var. **Sacchari-officinarum** *Mundkur*, var. nov.; a typo differt sporis "Vandyke Brown (Ridgway)", 6·5–11·3 (in medio 8·4)μ, episporio modice crasso, grossiuscule echinulato.

On *Saccharum officinarum* L. in the Philippine Islands, China, and India. Also on *S. spontaneum* L. in Negros Island (Philipp.). Type is U. S. D. A. Mycological and Pathological collections, No. 60442, collected by *O. A. Reinking* on 27/2/1917 at Los Baños and issued as *U. Sacchari* Rabenh.

Spore measurements of type specimen:

Diameter μ ...	6·5	7	8	9	10	11·3	
Frequency n ...	11	153	289	256	88	3=800	Mean=8·4μ

Spore measurements of specimen collected at Sambalpur, India, on 9/6/1909 on sugarcane:

Diameter μ ...	6·8	7	8	9	10·2	
Frequency n ...	4	40	54	83	19=200	Mean=8·4μ.

Spore measurements of specimen collected in Occidental Negros by *W. D. Pierce* on 26/12/1929 on *S. spontaneum*:

Diameter μ ...	6·3	7	8	9	10·2	
Frequency n ...	2	42	59	81	16=200	Mean=8·4μ.

Fifteen collections have been examined of which eleven are from the Philippines, three from China, one from India. The collection on sugarcane made in China by Reinking and determined by Saccardo (1921) (U. S. D. A. No. 60470) is this fungus. A Negros Island collection was on *Saccharum spontaneum* and was sent by Dr. J. A. Stevenson of the U.S. Department of Agriculture.

Key to the Species and Varieties.

Spores chestnut, smooth, thick-walled. Mean=4·9μ..... *U. consimilis*

Spores Mummy Brown, finely verrucose, thick-walled. Mean=6·6μ *U. scitaminea* var. *Sacchari-Barberi*

Spores Rood's to Prout's Brown, thin-walled, finely punctate. Mean=7·5μ.....*U. scitaminea*

Spores Vandyke Brown, medium thick-walled, coarsely echinulate. Mean=8·4μ.....*U. scitaminea* var. *Sacchari-officinarum*

Discussion.

In order to ascertain whether age had any effect on the morphological characters and spore-measurements, spores of *U. scitaminea* were collected from the same plant in the months of May, June and

July 1938. Spores were also collected in October 1938 from different sugar-cane varieties that had been infected by the same smut collection. No differences were noticed, indicating that neither the age or variety of the host had any influence on the morphological characters, including size of the spores.

The criterion of host specialization has been extensively adopted in the *Ustilaginales* and species have been distinguished on the basis of their ability to attack particular kinds of host plants. Until fifty years ago many of the cereal smuts were placed in *U. segetum* (or *U. carbo*) but the investigations of Jensen, Kellerman and Swingle, and others showed that they could be subdivided into independent entities not only by their cereal host specialization but on some readily distinguishable morphological and biological characters. But this splitting of old and classical species has recently been carried out rather promiscuously so that where there was one *U. violacea* (Pers.) Roussel, there are now eleven species (Liro, 1924) ; similarly *U. striaeformis* (Westend.) Niessl has been divided into ten species, and *Entyloma Calendulae* (Oudem.) de Bary into twenty-five species (Ciferri, 1932).

Against this view, Cunningham (1924) states that the object of taxonomy is to consider only those species as valid which possess distinct morphological characters, relegating to synonymy those separated on biological grounds. While there is some justification in this attitude, Butler (1929) suggests that in some special cases, stress can be laid on biological differences. The view of the neo-morphologists has been carried to an extreme extent by Fischer (1937) who has merged into *U. bullata* Berk. the two species *U. Lorentziana* Thümen and *U. bromivora* (Tul.) Fisch. v. Waldh. and its variety *U. bromivora* var. *macrospora* Farlow. This has been done furthermore without an actual examination of the type specimens of the species. In addition to showing considerable degree of host specialization, the merged species were distinguishable by the localization of their spores, by the distinctive characters of the spores and by their size. The low coefficients of variation of the spore-size indicated furthermore that there was considerable homogeneity in the populations.

To an investigator of diseases, it is of primary importance to know whether his host plants and the pathogens are or are not pure, and proper determination of species is pre-requisite to his experimental work. If species of fungi with different modes of transmission and different host ranges are lumped together on general considerations which themselves are not above question, then his work will be strewn with difficulties. In the case of the sugar-cane smuts, the spore colour, surface markings, size and above all the low coefficients of variability which signify homogeneity, all show that they cannot be considered as conforming to one species. The differences noted are not fortuitous but definite and no hesitation is felt in proposing therefore the two new varieties.

Summary.

1. In 1924 Sydow pointed out that the name *Ustilago Sacchari* Rabenh. had been erroneously applied to the smut of sugar-cane (*Saccharum officinarum* and *S. Barberi*) and proposed the name *U. scitaminea* for it. As the reasons adduced by Sydow were quite sound, the nomenclature proposed by him has been accepted by mycologists.

2. A critical examination of seventy-three collections of these smuts was recently made and on the basis of spore-colour, surface markings, thickness of the spore-wall and size, a conclusion has been reached that the culmicolous smut on sugarcane consists of one species and two new varieties, to which the names *U. scitaminea* var. *Sacchari-Barberi* and *U. scitaminea* var. *Sacchari-officinarum* have been given. The former variety has much smaller spores and the latter has consistently longer spores than those of the main species.

Acknowledgments.

The writer wishes to record his grateful thanks to Mr. L. D. Galloway, formerly Imperial Mycologist, for suggesting this study and to Mr. S. F. Ashby, Director, Imperial Mycological Institute, and Dr. G. R. Bisby of the same Institute, for critically reading the manuscript and for making several valuable suggestions. The latin diagnoses of the new varieties were kindly supplied by Mr. E. W. Mason.

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LVII—ADDITIONS TO THE FLORA OF BORNEO AND OTHER MALAY ISLANDS: XV.*

The Winteraceae, Lauraceae and Menispermaceae of the Oxford University Expedition to Sarawak, 1932.

H. K. Airy-Shaw.

For explanation of abbreviations, see K.B. 1939, 275.

Winteraceae

Drimys piperita *Hook. fil.* in Hook. Ic. Pl. **9**, t. 896 (1852); Stapf in Trans. Linn. Soc. ser. 2, **4**, 128 (1894).

Dulit Ridge, moss-forest on brink of precipice, *c.* 1230 m., 9 Sept., *Richards* 1645: "Petals white. Shrub, *c.* 2–3 m. high."

Ulu Koyan, white sand forest, between 800 and 1000 m., 15 Sept., *Native Collector* 1872: "Fls. white. Shrub."

Dulit Ridge, open moss-forest on exposed peak (also occurs in "heath forest"), *c.* 1300 m., 17 Sept., *Richards* 1896: "Shrub, 2–3 m. high. Petals white. Leaves thin, glaucous beneath. White latex."

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* Continued from K.B. 1939, 517.

Dulit Ridge, open moss-forest, *c.* 1300–1400 m., 8 Nov., *Richards* 2507 : " Shrub, 2–3 m. high. Petals white, minutely rugose. Stamens yellow. Leaves glaucous beneath."

LAURACEAE

Beilschmiedia titanophylla *Airy-Shaw*, sp. nov., ex aff. *B. longipedicellatae* Ridley et forsan *B. tawaënsis* Merr., ab utraque foliis giganteis usque 64 cm. longis et 30 cm. latis valde distincta.

Arbor parva, statura ignota. *Ramuli* usque 7 mm. diametro, cortice pallido striato sub lente parce piloso, innovationibus dense pallide cinnamomeo-tomentosis. *Folia* ingentia, alterna, obovata, 51–64 cm. longa, 23–30 cm. lata, basi late cuneata, apice obtusa vel vix rotundata brevissime cuspidato-caudata, cuspide 1–2 cm. longa tenui acuta, integerrima, tenuiter chartacea, siccitate olivacea, supra glabra, subtus molliter breviter subvelutino-pubescentia ; costa valida, supra plana vel vix impressa, glabra, subtus valde prominens, tomentosa ; nervi laterales 15–20-jugi, patulo-procurvi (infimi subpatentes), vix arcuato-anastomosantes, nervis secundariis inter primarios laxe scalariformiter dispositis ; petioli 3–4·5 cm. longi, 3–4 mm. diametro, lateraliter compressi, supra glabri, subtus plus minus tomentosi. *Thyrsi* ex innovationibus orti, extra-axillares, elongati, laxi, 35–38 cm. longi, breviter haud dense patulo-pubescentes, pedunculo 15–20 cm. longo, ramis brevibus 1–2·5 cm. longis bracteis oblanceolatis 5–8 cm. longis involutis subtus dense supra sparsius cinnamomeo-tomentosis suffultis, ramis apice in ramulos 2 breves 2–5 mm. longos divisis, ramulis cymas 3–7-floras gerentibus, pedicellis usque 5 mm. longis puberulis. *Perianthii segmenta* 6, latissime ovata vel fere orbicularia, 2·5–3·5 mm. longa, 2·5 mm. lata, valde concava, extra et intus parce adpresse puberula. *Stamina* seriei primi (extimi) oblonga, 1·5 mm. longa, filamentis longe pubescentibus, antheris glabris introrsis ; seriei secundi similia ; seriei tertii angustiora, magis subulata, ut videtur extrorsa sed sterilia, glandulis basalibus nullis ; staminodia 3, circiter 1 mm. longa, breviter oblanceolata, acuta, inferne pubescentia, superne glabra. *Ovarium* oblongo-ovoïdeum, 1·25 mm. longum, in stylum tenue 0·75 mm. longum attenuatum, glabrum, stigmate breviter 3-lobo, lobis recurvis ; ovulum 1, pendulum. *Fructus* ignotus.

Gunong Balapau, Ulu Tinjar, primary forest on steep slope, *c.* 500–600 m., 2 Nov., *Native Collector* 2438 : " Small tree. Fls. greenish."

This remarkable species, which has larger leaves than any other Lauraceous plant known to the writer, differs from *Beilschmiedia*, as hitherto defined, in the absence of the stipitate glands between the 2nd and 3rd rows of stamens. Ridley makes no mention of glands in his description of *B. longipedicellata*, from the Malay Peninsula, which, judging from a fruiting specimen (*Md. Soh* 8170) in Herb. Kew., is a closely allied plant. The softly pubescent, almost membranous leaves are also unusual in *Beilschmiedia*. The currently accepted distinctions between *Beilschmiedia*

and the closely related genera *Dehaasia* and *Alseodaphne* are very unsatisfactory. It may eventually be necessary to transfer these species to one of the latter, or else to establish a separate genus for their reception.

Cryptocarya Kurzii *Hook. f.* in Hook. f. FBI. **5,** 119 (1886).

var. **subsericea** *Airy-Shaw*, var. nov. foliis subtus persistenter breviter subsericeis siccitate pallide brunneis, inflorescentiis brevissimis (? an semper).

Gunong Balapau, Ulu Tinjar, primary forest, *c.* 800–900 m., 2 Nov., *Richards* 2443 : " Tree, c. 20 m. high. Fls. yellowish brown." Also : Baram distr., Miri River, Jan. 1895, *Hose* 66.

var. **argentea** (*Gamble*) *Airy-Shaw*, stat. nov.

Cryptocarya argentea Gamble in KB. 1910, 144 et in JASB. **75,** 51 (1912) ; Ridl. FMP. **3,** 81.

C. Kurzii Hook. f. sec. Gamble in JASB. l.c. 49, quoad *King's Collector* 6083 tantum, non Hook, f.

Foliis subtus valde caesio-glaucis minus puberulis tantum differt.

Perak. Goping, dense jungle, hilly localities, 90–240 m., May 1884, *King's Collector* 6083 : " A tree 50 to 70 ft. high. Stem 10 to 15 in. diam. Leaves rich glossy deep green, slaty blue underneath. Flower pale greenish yellow." Batang Padang, dense jungle, low hills, 90–150 m., Aug. 1885, *King's Collector* 7966 : " A tree 50 to 70 ft. high. Stem 15 to 20 in. diam. Leaves bright green, silvery grey underneath. Fruit dark green, young."

Pahang. Ulu Sungei Rompin, 18 May 1928, *Md. Soh* 15468.

Gamble suspected that *K.C.* 6083 might represent the flowering stage of his *C. argentea*, but eventually decided against it. I am at a loss to understand his reasons for this decision. I agree, however, with Ridley (l.c. 82) that *C. argentea* is not specifically separable from *C. Kurzii*. The type and the variety seem distinct in the Malay Peninsula, but the Bornean forms are intermediate, though on the whole nearer to *Kurzii*. Such are the following specimens (all from Sarawak) in Herb. Kew. : Sine loc., *Beccari* 3395, 3519, 3898 ; Rejang, Sibu, Feb. 1893, *Kalong* for *Haviland* 3082 ; sine loc., *Native Collector* (Sar. Mus. for Bur. Sci. Manila) 91.

Actinodaphne fuliginosa *Airy-Shaw*, sp. nov., *A. oleifoliae* Gamble et *A. gelonioïdi* Ridley affinis, ab illa foliis multo minoribus subtus haud glaucis, ab hac foliis obtusis vel rotundatis subtus haud areolatis, ab utraque ramulis annotinis petiolisque atro-tomentellis differt.

Frutex circiter 3–4 m. altus. *Ramuli* teretes, usque 4 mm. diametro ; innovationes dense castaneo-tomentellae et simul sparsius longe adpresso-sericeae ; ramuli annotini atro-tomentelli, demum glabrescentes cortice brunnescente vel cinereo. *Folia* per 3–5 (plerumque 4) pseudo-verticillata, obovata vel elliptico-obovata, rarius suboblonga vel late elliptica, 3·5–6 cm. longa, 1·5–3 cm. lata, basi late cuneata vel vix rotundata, apice obtusa vel rotundata, margine integra levissime recurva, firme coriacea, supra costa castaneo-puberula excepta glabra, nitidula, subtus primo crispule castaneo-puberula cito glabrata, siccitate pallide viridia ; costa supra leviter impressa, subtus prominula, pallida ; nervi laterales graciles, circiter 5-jugi, patuli, prope marginem arcuato-anastomosantes, supra tenuiter insculpti, subtus vix

prominuli ; venuli ultimi valde inconspicui, haud vel rarissime areolati ; petioli 8–10 mm. longi, modice graciles, novelli sicut innovationes, annotini sicut ramuli annotini induti. *Flores* (masculi tantum cogniti) valde sparse editi, in fasciculis brevissimis 1–5-floris plerumque extra-axillaribus orti, longe rufo-pubescentes. *Pedicelli* circiter 2 mm. longi, rufo-pubescentes. *Perianthii* tubus 1 mm. longus ; segmenta 6, suborbicularia vel late ovata, 1·5–2 mm. diametro, obtusa vel subacuta, extra pubescentia, intus glabra. *Stamina* 9, exteriora 6 perianthio subaequilonga vel eo paullo longiora, intima 3 perianthio breviora : filamenta longe villosa ; antherae oblongae. *Ovarii rudimentum* nullum. *Fructus* ignotus.

Dulit Ridge, open moss-forest on exposed peak, *c.* 1400 m., 17 Sept., *Synge* 1893 : " Petals pale yellowish green. Leaves blackish green above, glaucous below. Shrub, *c.* 3–4 m. high."

Readily distinguished from its nearest allies by the close sooty-black indumentum of the year-old twigs and petioles.

It may be remarked here that the Bornean form of *A. oleifolia* referred to by Gamble (in KB. 1910, 313, et in JASB. **75,** 122 : 1912) is almost identical with Ridley's variety *glabra* from Gunong Tahan, but until flower of the latter or fruit of the former is known a direct comparison is not possible. The number (334) of the *Haviland & Hose* specimen cited by Gamble is apparently an error, since the specimens written up by him in Herb. Kew., with his dissections attached, are nos. 3647 J and 3647 K. The same form is represented by *Native Collector* 2174 (through Sar. Mus. for Bur. Sci., Manila, Feb.–June 1914), from Sarawak, without precise locality.

Litsea montis-dulit *Airy-Shaw*, sp. nov., ex affinitate *L. grandis* (Nees) Meissn., a qua habitu minus robusto, foliis multo minoribus elliptico- vel subovato-oblongis (nec obovatis) siccitate supra laete viridibus, nervis lateralibus paucioribus, nervis tertiariis obscuris, umbellulis minoribus siccitate saturatius brunneo-tomentosis abunde differt.

Arbor circiter 15 m. alta, trunco circiter 13 cm. diametro. *Ramuli* usque 7 mm. diametro, teretes, juniores leviter sulcato-angulati, cortice cinereo-fusco glabrescente, innovationibus breviter dense brunneo-tomentellis. *Folia* elliptico- vel subovato-oblonga, rarius leviter obovato- vel oblanceolato-oblonga, 6–13·5 cm. longa, 2–6·5 cm. lata, basi rotundata rarius levissime angustata, apice angustata vel vix brevissime acuminata obtusa, margine integra levissime decurva, firme coriacea, supra glaberrima (nisi valde juvenilia brunneo-tomentosa) nitida siccitate laete viridia, subtus brevissime nec dense asperulo-velutina pallide brunnescentia ; costa supra fere plana vel levissime impressa, subtus prominens 1–2 mm. lata brunneo-tomentosa, nervis lateralibus 5–8-jugis gracilibus anguste patulis valde sursum procurvis supra planis subtus prominentibus brunneo-tomentellis marginem versus evanescentibus nec anastomosantibus ; petioli 1–1·5 cm. longi, 2 mm. crassi, brunneo-tomentosi, rugulosi. *Umbellulae* plerumque 2–3 in racemos abbreviatos usque 5 mm. longos saepe fasciculiformes plerumque ex axillis defoliatis ortos dispositae ; pedunculi 5–9 mm.

longi, 1·5 mm. crassi, dense tomentosi, saturate brunnei ; bracteae involucrales 4, suborbiculares, 6–7 mm. longae et fere aequilatae, rotundatae, valde cucullatae, extra dense brunneo-tomentosae, intus glabrae. *Flores* ♀ tantum cogniti, circiter 6 in quaque umbellula, 1–2 mm. pedicellati. *Perianthii* tubus trigono-ovoïdeus, extra tomentosus, 2 mm. longus ; segmenta 6, oblanceolato-elliptica, 2–2·5 mm. longa, 0·5–1·5 mm. lata, obtusa, extra sericea. *Staminodia* 12, lineari-clavata, inferne villosa, 6 exteriora circiter 2 mm. longa, simplicia, 6 interiora breviora, glandulis binis magnis discoïdeis glabris praedita. *Pistillum* sigmoïdeum, 3·5 mm. longum, glabrum : ovarium 1 mm. longum, trigonum, in stylum sensim attenuatum ; stigma magnum, foliaceum, irregulariter lacerum, 2 mm. latum. *Fructus* ignotus.

Dulit Ridge, " transition " forest, *c.* 1200 m., 9 Sept., *Synge* 1649 : " Tree, about 15 m. high, *c.* 13 cm. diam. (probably young spmn.). Fls. buff-coloured. Timber useful."

Vernacular name : *medang impangor*.

The most striking feature of the herbarium material is the contrast between the bright green shining upper surface of the leaves and the deep sepia brown of the numerous inflorescences. *L. grandis* has been given as its affinity on account of the pubescent lower leaf-surface (see Gamble's key in Mat. Fl. Mal. Penins. **5**, 125 : 1912), but *L. castanea* Hook. f. is perhaps equally closely allied, though with glabrous or almost glabrous leaves.

Litsea singaporensis *Gamble* in KB. 1910, 358 ; Ridl. FMP. **3**, 122 ; vel aff.

Dulit, crest of ridge, primary forest, under 300 m., 29 Oct., *Richards* 2361 : " Tree, 24 m. high, 5 cm. diam. Traces of buttresses."

Vernacular name : *medang kuning*.

Neolitsea amabilis *Airy-Shaw*, sp. nov. ex affinitate *N. latifoliae* (Bl.) S. Moore atque *N. formosae* S. Moore, ab utraque foliis subtus pulchre rufo-tomentellis facile distincta.

Frutex gracilis, circiter 3 m. altus. *Ramuli* usque 5 mm. diametro, teretes, striati, cortice annotinorum cinereo glabrescente, hornotinorum brunneo rufo-puberulo. *Folia* alterna vel subopposita, apicem cujusque anni incrementi versus aggregata, latissime elliptica, 7–8·5 cm. longa, 3·5–5·2 cm. lata, basi rotundata usque cuneata, apice abruptiuscule acuminato-cuspidata, cuspide 1–1·5 cm. longa obtusa vel subacuta, margine integra subrevoluta, rigide coriacea, supra costa puberula excepta glabra siccitate pallide griseo-brunnea, subtus omnino dense adpresse rufo-tomentella (ipsa epidermi glauca), seniora nigro-tomentella ; nervi primarii laterales 1-jugi, subbasales, 3–4 mm. supra basin costae orti, subrecti, usque duas trientes laminae attingentes, dein incurvi et evanidi, nervis secundariis e costa apicem versus ortis 2–4-jugis, omnes sub-bullato-impressi, subtus plerumque glabrati ; petioli circiter 1 cm. longi, 2 mm. lati, dense tomentelli, rugulosi.

Glomerulae in capitula circiter 6-glomerulata brevissime (1–2 mm.) pedunculata axillaria extra-axillaria et subterminalia aggregatae, pedunculis bracteis parvis 5–6 instructis, 1–3-florae, bracteis 4 magnis suborbicularibus 3–4 mm. diametro valde cucullatis inclusae. *Flores* ♂ tantum cognitae. *Pedicelli* 3 mm. longi, dense longe ferrugineo-villosi. *Perianthii segmenta* 4, oblonga usque late elliptica, 3 mm. longa, 1–1·5 mm. lata, obtusa vel subacuta, glabra, tubo brevi villoso. *Stamina* 6, perianthio subaequilonga, basi longe villosa, 2 interiora glandulis 2 peltatis infra medium praedita, antheris 0·75 mm. longis. *Fructus* ignotus.

Dulit, open moss-forest, *c.* 1230 m., 2 Oct., *Richards* 2096: "Slender shrub, *c.* 3 m. high. Fls. yellowish green."

A distinct and attractive species on account of the fine red-brown indumentum on the underside of the broadly elliptic, cuspidate-acuminate, almost bullate leaves.

The following plant from the Malay Peninsula is evidently very closely allied and may conveniently be described here as:

var. **sericea** *Airy-Shaw*, var. nov., ramulis hornotinis foliis subtus bracteis extra adpresse rufo-sericeis, foliis angustius ellipticis vel obovato-ellipticis 2·5–4·3 cm. longis breviter subcuspidatis haud bullatis, petiolis circiter 1·5 cm. longis.

Selangor. Gunong Mengkuang, 1500 m., 2 Feb. 1913, *H. C. Robinson* sine no.

This bears a superficial resemblance to large-leaved forms of *Lindera rufa* (Stapf) Gamble and may prove to be worthy of specific rank.

Lindera malaccensis *Hook. f.* in Hook. f. FBI. **5,** 183 (1886); Ridl. FMP. **3,** 133.

Tetranthera Griffithii Meissn. in DC. Prodr. **15** (1), 191 (1864), non *Lindera Griffithii* Meissn. l.c. 245.

Dulit, primary forest, under 300 m., 12 Nov., *Richards* 2565: "Tree, 9 m. high. Fls. greenish white."

Menispermaceae

Stephania cf. **venosa** (*Bl.*) *Spreng.* Linn. Syst. Veg. ed. 16, **4** (2), 316 (1827); Diels in Engl. Pflanzenr. IV. **94** (Menisp.), 271 (1910).

Clypea venosa Bl. Bijdr. 27 (1825).

Dulit, secondary forest on hill ridge, *c.* 300 m., 5 Aug., *Richards* 1126: "Climber to *c.* 10 m. on low trees. Lower part of stem bearing flowers leafless. Flowers yellowish green."

Cyclea elegans *King* in JASB. **58** (2), 387 (1889); Diels, Menisp. 311 (1910); Ridl. FMP. **1,** 115.

Dulit Trail, primary forest on steep spur of mountain, *c.* 700 m., 27 Aug., *Richards* 1483: "Small climber in undergrowth. Fls. green."

Leaves (laminae) up to 15 cm. long, but otherwise a perfect match of the type material from Perak. The species is new to Borneo.

LVIII—ADDITIONS TO THE FLORA OF BORNEO AND OTHER MALAY ISLANDS: XVI.

THE MYRISTICACEAE OF THE OXFORD UNIVERSITY EXPEDITION TO SARAWAK, 1932. H. K. AIRY-SHAW.

For explanation of abbreviations, see K.B. 1939, 275.

Myristica villosa *Warb.* Mon. Myrist., in Nov. Act. Abh. Deutsch. Akad. Naturf. **68,** 419, t. XIV (1897).

Dulit Trail, primary rain-forest on top of steep ridge, *c.* 400 m., 10 Aug., *Richards* 1190: "Tree, height about 30′, diam. at breast height *c.* 8″. Bark fairly smooth, with minute shallow longit. fissures. No buttresses. Fls. [♂] light brown."

Vernacular name: *kumpang.*

A description of the hitherto unknown male flowers of this species is appended:

Flores ♂ ex axillis foliorum delapsorum singulatim vel saepius binatim orti, subsessiles, bracteis 2–3 suborbicularibus 4–5 mm. diametro longe fulvo-sericeis caducis suffulti. *Perianthium* campanulatum, 5–6 mm. longum, fere usque ad basin tripartitum, crassum, extra dense longe fulvo-sericeum, intus glabrum et striatum, segmentis 3–4 mm. latis subobtusis. *Columna staminea* circiter 3 mm. longa, vix 1 mm. crassa, apice subtruncata, stipite brevissimo basi piloso, antheris circiter 12 connatis.

The lateral nerves of the leaves are rather more numerous than in the type, 25–32 pairs instead of 16–25, and the lower surface is less densely villose, but these are probably only individual fluctuations.

Myristica Cumingii *Warb.* Myrist. 442, t. XIII (1897).

var. **floribunda** *Airy-Shaw*, var. nov. inflorescentiis majoribus umbellato- vel fasciculato-racemosis magis floriferis usque 6·5 cm. longis.

Dulit Trail, primary forest on spur of mountain, *c.* 800 m., 29 Aug., *Native Collector* 1522: "Woody climber on tall tree. Corolla white."

Dulit Trail, rain-forest on side of mountain, *c.* 900 m., 8 Sept., *Richards* 1615 (typus, Herb. Kew.): "Tree, *c.* 8″ diam."

Vernacular name: *medang lit.*

The branched inflorescence and glabrous leaves at first seemed to indicate one of the first five series in Warburg's key (l.c. 374–5), but it is evident that the former character, in this case at any rate, is of only secondary importance, the true affinity of this plant being clearly with series 9–11 (l.c. 376–7). In foliage it is practically indistinguishable from Cuming's Philippine specimens. To this variety is provisionally referred the following specimen from BRITISH NORTH BORNEO: Sibugal River, Apr. 1927, *Agullana* 3887: "Fl. yellow."

Typical *M. Cumingii* bears a strong superficial resemblance to *M. cinnamomea* King, of the Malay Peninsula.

Gymnacranthera crassinervis *Warb.* Myrist. 362, t. xx (1897).

Dulit, secondary forest, under 300 m., 19 Oct., *Richards* 2289 : " Tree, probably 10–15 m. high. Fls. bright yellow."

Horsfieldia rufo-lanata *Airy-Shaw*, sp. nov., *H. reticulatae* Warb. affinis, a qua foliis late ellipticis subtus dense rufo-ferrugineo-tomentosis, inflorescentiis brevioribus dense longe ferrugineo-lanatis, floribus dense aggregatis (nec tamen pressione angulatis) differt.

Arbor 17 m. alta, trunco 19 cm. diametro. *Ramuli* usque 1 cm. diametro, cortice ruguloso-striato glabrescente, innovationibus pilis dendroïdeis dense ferrugineo-lanatis. *Folia* late elliptica vel fere oblongo-elliptica, 17–22 cm. longa (et forsan ultra), 9–12 cm. lata, basi rotundata, apice obtusa usque subacuta (nullo modo acuminata), margine primum leviter recurva demum subplana, integra, coriacea, supra costa nervisque exceptis glabra, olivacea vel olivaceo-brunnea, nitidula, subtus pilis brevibus dendroïdeis dense ferrugineo-tomentosa, demum glabrescentia ; costa supra prominula, secus medium sulcata, breviter pubescens, subtus crasse prominens, tomentosa et primum pilis subsimplicibus longe villosa, tenuiter striata, nervis lateralibus 13–15-jugis sat robustis late patulis subrectis vel leviter sursum curvatis prope marginem regulariter arcuato-anastomosantibus (arcubus proximis arcu intermedio distincto conjunctis) supra alte bullato-insculptis sed ipsis tenuiter prominulis interdum sicut costa sulcatis subtus valde argute prominentibus tomentosis, nervis tertiariis inter secundarios laxe subscalariformiter dispositis subobscuris ; petioli robusti, rugosi, 1–1·5 cm. longi, tomentosi. *Inflorescentiae* ♂ tantum cognitae, ex axillis foliorum delapsorum ortae, pyramidales, 5–8·5 cm. longae, circiter 4 cm. latae, inferne saepe eramosae, floribus pedicellisque exceptis dense longe ferrugineo-lanatae, rhachi robusta inferne 4–5 mm. crassa, ramis brevibus patulis vel patentibus. *Flores* apicem ramorum versus dense subumbellatim conglobati, pedicellis glabris 1–1·5 mm. longis. *Perianthium* oblate globosum, 2 mm. diametro, 3- vel saepius 4-fidum, glabrum, sublucidum, sub lente minute pellucido-punctatum. *Antherae* circiter 40, in massam globosam brevissime stipitatam apice basique alternatim 3- vel 4-rimosam connatae, marginibus subliberis. *Fructus* incognitus.

Dulit Ridge, forest by waterfall, *c.* 1200 m., 10 Sept., *Richards* 1667 : " Tree, 17 m. high. Diam. 19 cm. Underside of leaves and peduncles covered with reddish brown tomentum."

A handsome species. The shaggy rusty covering of the rather short congested inflorescences immediately distinguishes it from *H. reticulata* Warb. The leaves of the latter are not, as erroneously stated by Warburg (Myrist. 266, 304), glabrous, but are distinctly rusty-pubescent on the midrib beneath with dendroid hairs similar to those of *H. rufo-lanata*. The more frequent occurrence of tetramerous than of trimerous flowers in this species is noteworthy.

Horsfieldia xanthina *Airy-Shaw*, sp. nov., *H. majusculae* (King) Warb. affinis, sed cortice rugoso, foliis anguste oblanceolato-ellipticis 4–5 cm. tantum latis crassius coriaceis siccitate subtus laete castaneis, inflorescentiis plerumque brevioribus recedit.

Arbor 12 m. alta, ramulis usque 8 mm. diametro, cortice cinereo-brunneo rugoso saepe in laminas parvas subquadratas valde longitudinaliter et transverse fisso, innovationibus minute rubiginoso-puberulo cito glabrescentibus. *Folia* anguste oblanceolato-elliptica, rarius anguste elliptica vel oblongo-elliptica, 10–18 (plerumque circiter 15) cm. longa, 3–5 cm. lata, basi angustata in petiolum abruptiuscule (rarius sensim) attenuata, apice acuta, brevissime vel vix acuminata, margine integra, leviter recurva, coriacea, ut videtur leviter carnosa, glaberrima, siccitate supra obscure viridia vel brunnescentia, subtus laete castanea ; costa supra fere plana, subtus elevata, modice robusta, nervis lateralibus 12–16-jugis gracilibus patulis vel late patulis subrectis vel leviter sursum curvatis prope marginem regulariter arcuato-anastomosantibus supra leviter impressis subtus argute prominentibus, nervis tertiariis omnino obscuris ; petioli robusti, 7–10 mm. longi, 3 mm. crassi, supra valde canaliculata. *Inflorescentiae* ♂ tantum cognitae, e ramis annotinis et vetustioribus ortae, abbreviatae, 2–4 cm. longae, ferrugineae, floribus pedicellisque exceptis minutissime papilloso-puberulae, rhachi pro longitudine robusta inferne 1·5–2·5 mm. crassa, ramis 4–7 brevibus patulis vel patentibus 3–13 mm. longis, bracteis caducis non visis sed cicatricibus conspicuis elevatis. *Flores* 3–8 in apice ramulorum subumbellatim dispositi, pedicellis glabris cernuis 2–3 mm. longis suffulti, glabri, vivi colore gambogia dicto, siccitate ferruginei. *Perianthium* globosum, 2 mm. diametro, 3-4-fidum, basi valde incrassatum. *Antherae* circiter 10, subsessiles, in massam ellipsoïdeam 3- vel 4-gonam connatae, marginibus subliberis.

Ulu Koyan, sandy ("heath") forest, 800–900 m., 18 Sept., *Native Collectors* 1927 : "Tree, 12 m. high, 20 cm. diam. Fls. gamboge yellow. Red resin or latex in bark."

Vernacular names : *kumpang* ; *getah merah.*

Closely related to *H. majuscula* (King) Warb., but readily distinguished by the much narrower and thicker, almost fleshy, leaves, drying a light chestnut brown below. The male inflorescences of these two species are very similar (cf. *Scortechini* 837, *Ridley* 11919) and equally unlike those of any other species, being short and robust, with short spreading branches, the globose flowers about 2 mm. in diameter arranged subumbellately on each branch, on conspicuously curved pedicels. By some slip Warburg has included *H. majuscula* in Subsect. *Euirya*, "♂ Perigon fast stets 2 klappig" (Mon. 267, key), but the flowers are, as he states correctly in the description (p. 316), 3–4-merous. *H. glabra* (Reinw. ex Bl.) Warb. has rather similar short male inflorescences, and flowers about 2 mm. in diameter (Warb. l.c. 314, not 1·5 mm. as stated in the key, l.c. 266–7), and is perhaps related. The leaves of the present

species recall rather those of *H. carnosa* Warb. or *H. sucosa* (King) Warb., but these species have much smaller flowers.

Horsfieldia fragillima *Airy-Shaw*, sp. nov., ex affinitate *H. brachiatae* (King) Warb., *H. Lemannianae* (A. DC.) Warb. et *H. Ridleyanae* (King) Warb., ab illa ramulis lineis elevatis haud notatis, ab his foliis multo majoribus distincta.

Arbor 9 m. alta. *Ramuli* 5–10 mm. diametro, cortice brunneo glabro longitudinaliter fisso ut videtur laminatim decorticante. *Folia* elongate elliptico-oblanceolata, rarius fere oblonga, 25–40 cm. longa, 8–12 cm. lata, basi angustato-rotundata, apice sensim attenuata sed vix acuminata, ut videtur acuta, integra, chartacea, glaberrima, siccitate (maxime subtus) rubro-brunnea et fragillima ; costa supra plana, subtus rotundato-elevata, nervis lateralibus 20–30-jugis gracilibus fere rectis late patulis prope marginem regulariter arcuato-anastomosantibus supra prominulis subtus magis prominentibus, nervis tertiariis gracillimis subparallelis inter secundarios scalariformiter dispositis supra obscuris subtus aegre cernendis ; petioli robusti, 1·5 cm. longi, 4–5 mm. lati, supra e marginibus decurrentibus laminae bicarinati et sulcati, siccitate nigrescentes. *Inflorescentiae* ♂ tantum cognitae, rameales, 10–22 cm. longae, laxae, brevissime ferrugineo-furfuraceae, ramis patentibus vel subdeflexis inferioribus usque 9 cm. longis, bracteis caducis non visis. *Flores* (immaturi) minimi, turbinati vel depresso-globosi, vix 1 mm. diametro, glabri, siccitate nigri, pedicellis sublongioribus insidentes. *Perianthium* trifidum. *Antherae* circiter 8–10 in massam cupulari-turbinatam breviter stipitatam apice excavato-depressam connatae, marginibus vix liberis. *Fructus* incognitus.

Dulit, primary forest, under 300 m., 15 Nov., *Richards* 2602 : " Tree, 9 m. high. Inflorescence green."

Vernacular name : *kumpang*.

Warburg's classification of the species of *Horsfieldia* does not seem very satisfactory in this group, since the Sections *Pyrrhosa* and *Irya*, distinguished on the basis of whether the anthers are completely united or free at their edges, contain some closely related species, at least among the trimerous-flowered glabrous-leaved ones, which are separated in this arrangement. Moreover there appears to be no sharp division between the completely fused and the marginally free condition of the anthers. In the present species, especially, an intermediate stage seems to be represented, though the flowers are admittedly immature. At all events, Warburg's species 29, *H. amygdalina* (Wall.) Warb., in Sect. *Pyrrhosa* Subsect. *Eupyrrhosa*, would surely be better placed with species 35–38 forming Subsect. *Trivalves* of Sect. *Irya*.

The epithet *fragillima* refers to the exceedingly brittle nature of the large rather thin leaves of this species in the dried state.

Horsfieldia montana *Airy-Shaw*, sp. nov., *H. oligocarpae* Warb. ut videtur proxima, foliis crassius coriaceis rigidis siccitate minus

fragilibus supra nitidulis, nervis circiter 10-jugis, inflorescentia ♂ dense rubiginoso-tomentella distincta.

Arbor circiter 7 m. alta, ramulis usque 5 mm. diametro, cortice fusco-cinereo angulato-ruguloso glabro, innovationibus minute rubiginoso-puberulis. *Folia* oblongo-obovata, (4–) 6–9·5 cm. longa, 3–4 cm. lata, basi in petiolum abruptiuscule angustata, rarius subcuneata, apice optime rotundata vel leviter retusa, saepe nescioquo casu altius emarginata, margine integra, plana vel saepius plus minus revoluta, rigide coriacea, glaberrima, siccitate supra olivaceo-brunnea saepe nitidula, subtus rubido-brunnea; costa supra prominula basin versus saepe sulcata, subtus magis prominens, nervis lateralibus 8–12-jugis gracilibus late patulis leviter arcuato-adscendentibus supra prope costam argute prominulis subtus obscurioribus vix prominulis, nervis tertiariis utrinque omnino obscuris; petioli 8–10 mm. longi, 2 mm. crassi, rugulosi. *Inflorescentiae* ♂ tantum cognitae, ex axillis foliorum delapsorum ortae, plus minus pyramidales, usque 6 cm. longae, floribus pedicellisque exceptis dense rubiginoso-tomentellae, rhachi inferne vix 2 mm. crassa, ramulis usque 2 cm. longis patentibus vel conspicue deflexis bracteis ovato-ellipticis 3 mm. longis 2 mm. latis. *Flores* angulato-subglobosi, basi truncatuli, 1–1·3 mm. diametro, glabri, haud dense subglomerulati, pedicellis circiter 1 mm. longis glabris. *Perianthium* 3- rarius 4-fidum. *Antherae* 20–25, sessiles, in massam angulato-subglobosam omnino connatae.

Dulit Ridge, moss-forest, *c.* 1300 m., 8 Nov., *Native Collector* 2509: "Tree, *c.* 7 m. high."

This certainly seems very near to the imperfectly known *H. oligocarpa* Warb., for which Warburg suggested no relationship. The fracture of the dried leaves of the latter is very similar to that which is so characteristic of *H. Lemanniana* (A. DC.) Warb., and this is probably its true affinity. The male inflorescence of *H. montana* also supports this suggestion. The leaves of this species are evidently much tougher than those of *H. oligocarpa*, *H. Lemanniana* and their allies, since they show no sign of breaking up in the dried state.

Knema glauca (*Bl.*) *Warb.* Myrist. 594, t. xxv (1897).

Myristica glauca Bl. Bijdr. 576 (1825).

Palaquium prob. *rivulare* H. J. Lam, sec. H. J. Lam in KB. 1936, 17, non H. J. Lam in Bull. Jard. Bot. Buitenz. sér. 3, **8**, 403 (1927); vide KB. 1938, 306.

Dulit Trail, rocky forest near torrent, under 300 m., 3 Aug., *Richards* 1107: "Tree, *c.* 2·5 m."

Male flowers are present on the specimens, but Dr. Lam was probably misled by the similarity in foliage.

Knema tridactyla *Airy-Shaw*, sp. nov. distinctissima, foliorum paginae inferioris indumento tenui sordide griseo (illi *K. Elmeri* Merr. tantum comparabili sed plane absimili), inflorescentiae structura

anomala (cf. descr. infra), in genere unica ; *K. Wrayi* (King) Warb. adspectu similis sed vix arcte affinis.

Arbor parva, 2–3 m. alta. *Ramuli* graciles, teretes, 3–5 mm. diametro, cortice fusco inconspicue striato haud fisso, innovationibus breviter ferrugineo-tomentosis. *Folia* anguste oblonga, raro subelliptico-oblonga, 10–22 cm. longa, 2–5 cm. lata, basi rotundata, rarius subangustata, apice sensim attenuata acutissima, margine integra, saepe leviter undulata, revoluta, chartacea, supra glaberrima, nitidula, olivaceo-brunnea, subtus glauca, pilis minutis brevissime dendroïdeis substellatis ± intertextis detersibilibus subtilissime sordide griseo-fuligineo-tomentella ; costa modice gracilis, supra in sulco prominula, subtus elevata, nervis lateralibus gracilibus 15–20-jugis late patulis procurvis prope marginem evanidis vel obscurissime anastomosantibus supra bullatulo-impressis subtus tenuiter argute prominentibus, nervis secundariis valde obscuris angulo recto e costa ortis ; petioli 6–10 mm. longi, circiter 2 mm. crassi, teretes, supra alte canaliculati, rugosuli, primum tomentelli, demum glabri. *Inflorescentiae* (masculae tantum cognitae) axillares et ex axillis defoliatis, e racemis densis juliformibus 2–3 in apice pedunculi communis brevis digitatim dispositis sistentes : pedunculus communis 2–3 mm. longus, 1 mm. crassus ; racemi 2–17 mm. longi, 1·5 mm. crassi, saepe sursum curvati, apice tantum floriferi, tota longitudine cicatricibus florum delapsorum densissime et regulariter mammillosi (amenta nesciocujus *Betulae* vel *Alni* simulantes), incremento ut videtur perenni et infinito aucti, apice ferrugineo-tomentelli, inferne fusci et glabrescentes. *Flores* tantum 1–3 simul in apice cujusque racemi evoluti, ferrugineo-tomentosi, pedicellis 2–3·5 mm. longis gracilibus ferrugineis supra medium bracteola minuta instructis. *Perianthium* 1·5 mm. diametro, turbinatum, apice truncatulum, extra pilis dendroïdeis ferrugineis obsitum. *Antherae* 7–8, apice truncatae, stipite gracili sursum incrassato glabro, disco leviter concavo crenato vel breviter lobulato glabro. *Flores feminei* et *fructus* ignoti.

Dulit, primary forest on summit of steep ridge, under 300 m., 12 Aug., *Richards* 1220 : " Small tree, 2–3 m. high."

This very distinct species does not appear to be closely related to any hitherto described. Warburg states in his generic description of *Knema* (Mon. p. 132) that the inflorescence is never branched or forked, but later describes that of *K. Kunstleri* (King) Warb. (p. 569) as bifid or trifid, of *K. lenta* Warb. (p. 584) as bifurcate, and of *K. oblongifolia* (King) Warb. var. *monticola* (King) Warb. (p. 587) and of *K. pulchra* (Miq.) Warb. (p. 600) as bilobed. Of these four species, *K. Kunstleri* affords the clearest example of a branched inflorescence, but is not otherwise a near relative of the present species.

The inflorescence of *K. tridactyla* consists typically of a terminal raceme, and two lateral apparently opposite racemes, arranged digitately on a short axillary peduncle. The racemes have the

power of unlimited growth, those towards the apex of a branchlet being extremely short, while those on the older wood may have elongated considerably, the longest seen being 17 mm. in length. Not more than 3 fully developed flowers were observed on any raceme, and these arose from the extreme apex. The persistent bases of the pedicels, arranged with great regularity in a close (? double) spiral, are extremely characteristic and bear a superficial resemblance to the catkins of certain *Amentiferae*, or to the peduncle of *Stemonurus corniculatus* (Becc.) Ridley. The only other species of *Knema* in which a comparable structure occurs are *K. sphaerula* (Hook. f.) Airy-Shaw,* the type-specimens of which (Malacca, *Cantley*, Herb. Kew.) show it very clearly, as noted by Hooker (l.c. infra), and *K. oblongifolia* var. *monticola*, especially *King's Collector* 835, cited by Warburg (l.c. 587), presumably by inadvertence, under *K. oblongifolia* itself.

The indumentum of the lower-leaf surface is unlike that of any other species. It consists of a very thin layer of minute, dirty grey or sooty, dendroid or almost stellate hairs. This layer seems easily removable, leaving the glaucous epidermis uncovered. The nearest approach to it is found in *K. Elmeri* Merr., in which, however, the layer is a light silvery grey, much more dense and regular, composed of closely interwoven stellate hairs, and interspersed with minute, scattered, ferrugineous, dendroid hairs.

LIX—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: XLIII.†

FURTHER RESULTS OF RECENT COLLECTIONS IN BRITISH GUIANA.‡

N. Y. SANDWITH AND OTHERS.

The following descriptions and records are of plants collected, for the most part, by Mr. Sandwith on his second visit to British Guiana in the summer of 1937, by the Forest Department, or by the recent Boundary Commission. The help of Prof. C. E. B. Bremekamp, Dr. H. A. Gleason, Dr. J. Lanjouw, Dr. H. Uittien, Dr. A. J. P. Oort and Dr. Robert E. Woodson Jr., is gratefully acknowledged.

POLYGALACEAE

Securidaca uniflora *Oort*, confirm. Oort.

Kaieteur Savannah, on the fringe of high forest, c. 1200 ft., fl. and fr. Sept. 5th, 1937, *Sandwith* 1365. Climber over small trees. The two large wing sepals are at right angles to the pedicel, and white. Upper petals deep chocolate, except at the white base. Keel pale claret.

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* **Knema sphaerula** (*Hook. f.*) *Airy-Shaw*, comb. nov.—*Myristica sphaerula* Hook. f. in Hook. f. FBI. **5,** 859 (1890). *M. missionis* Wall. ex King in ABGC. **3,** 321 (1891). *Knema missionis* (Wall. ex King) Warb. Mon. Myrist. 602 (1897).

† Continued from K.B. 1939, 521.

‡ See K.B. 1939, 3.

Distr. Surinam. First record for British Guiana. The fruits are now collected for the first time.

Quiinaceae

Quiina oblanceolata *Sandwith* sp. nov. ; *Q. obovatae* Tul. affinis, ramulis superne stipulis petiolis dense pubescentibus, racemis brevibus dense pubescentibus, fructu majore pyriformi differt.

Arbor mediocris ; ramuli summi juniores superne compressi 4 mm. lati, ferrugineo-pubescentes. *Folia* oblanceolata vel obovata, apice obtusa, acuta vel breviter late cuspidata, saepe etiam rotundata emarginata, basin versus longe attenuata cuneata et in petiolum decurrentia, ad 25 cm. longa, ad 8·3 cm. lata, glanduloso-denticulata, coriacea, praesertim subtus nitida, siccitate supra brunneo-chocolatina subtus brunnea, costa supra inferne sparse pubescente excepta glabra, costa utrinque praesertim subtus prominente, nervis lateralibus utroque costae latere vulgo 20–28 patulis sed denique in marginem sursum arcuatis supra elevatis prominentibus subtus planis vel subimpressis, venulis immersis haud cernendis ; petiolus 0·5–1·5 cm. longus, dense pubescens. *Stipulae* subulatae, 1 cm. longae, dense pubescentes. *Inflorescentiae* secus ramulos crassos vetustos pro maxima parte defoliatos exorientes ; racemi in quaque axilla numerosi, congesti, breves, 0·5–1 cm. longi, pubescentes ; bracteae late ovatae, obtusae, valde concavae, circiter 1 mm. longae, dense ferrugineo-pubescentes ; pedicelli ex axillis bractearum solitarii, graciles, glabri, 5–11 mm. longi. *Flores* masculi tantum visi, flavidi. *Sepala* 4, oblonga vel ovata, obtusa, valde concava, 1·5–2 mm. longa, vix 1·2 mm. lata, praesertim prope apicem conspicue ciliata, ceterum glabra. *Petala* 4, obovato-oblonga, valde obtusa, rotundata, 2·5–4 mm. longa, 2–2·3 mm. lata. *Stamina* circiter 25, filamentis 1·5–2 mm. longis ; antherae globosae, 0·3 mm. longae atque latae. *Ovarii* rudimentum deest. *Fructus* pyriformis, sub semine velut stipite lato contractus, 1·2–1·5 cm. longus, 0·7–1·1 cm. diametro, glaber, crebre tenuiter striatus, sepalis basi persistentibus ; semen unicum globosum, aureo-fulvo-tomentosum, velutinum, 7–8 mm. diametro.

British Guiana. Wiruni River, Berbice River, in mixed high forest, fl. Feb. 10th 1938, *Davis* in *Forest Dept.* 2606 (typus) : tree 75 ft. high, 6 in. diam., very slightly buttressed ; flowers creamy-yellow. Issororo River, 1888, *im Thurn* in *Jenman* 5197.

Sterculiaceae

Ayenia praeclara *Sandwith*, sp. nov. ; inter omnes species ob faciem singularem ad *A. stipularem* Tr. et Pl. tantum approximans, a qua foliis apicem versus integris, stipulis minoribus, praesertim forma inflorescentiarum omnino abhorrente, petalorum cucullo dorso laminifero longe distat.

Arbor parva inermis, ramulis stellato-puberulis ; internodia ad 1·3 cm. longa. *Stipulae* subulatae, ad 4 mm. longae. *Folia* oblanceolata vel oblanceolato-oblonga, apice longe (1·5–3 cm.) acute

caudato-acuminata, basin versus cuneatim attenuata sed basi ipsa rotundata, 11–16·5 cm. longa, 3·7–5·4 cm. lata, satis tenuiter chartacea, glabra, basi trinervia, nervis primariis utroque costae latere 7–8 arcuatim ascendentibus, his cum costa supra prominulis subtus prominentibus, secundariis subparallelis subtus tenuiter elevatis, rete venularum intricatissimo sub lente manifesto ; glandula subtus in costa paulo supra basin lineari-oblonga, 2–3·5 mm. longa, perforata, nonnunquam haud evoluta ; petiolus 4–5 mm. longus, parce stellato-puberulus. *Flores* axillares, in quoque nodo circiter ad 15 umbellati ; ramuli igitur valde floriferi ; perulae brunneo-tomentosae ; pedicelli filiformes, stellato-pilosuli, ad 1 cm. longi, prope medium (paulo supra) articulati. *Calyx* albus, 3·5 mm. longus ; lobi ovato-lanceolati, 1·75 mm. lati, marginibus lanuginosis ceterum glabrescentes. *Petalorum* unguis more generis filiformis, gracillimus, perconspicuus, glaber, albus, 8 mm. longus ; cucullus roseus, triangulari-obcordatus, 1·5-1·75 mm. longus, 2–2·2 mm. latus, apice inflexus bilobus atque quadridentatus, dentibus externis multo longioribus 0·5 mm. longis incrassatis subfalcato-incurvis ; lamina e dorso cuculli exoriens glanduliformis, spathulato-clavata, 1·3–1·5 mm. longa. *Gynophorum* glabrum, 3·5–4·5 mm. longum. *Tubus staminalis* campanulatus, circiter 0·75 mm. longus ; stamina filamentis ad 0·5 mm. longis ; antherae tres thecas gerentes. *Ovarium* ovoideum, verruculosum, apice parce pilosum, stylo incluso 0·6–1 mm. longum. *Fructus* non visus.

British Guiana. Brazilian boundary survey : New River, Sun River Divide, near Boundary Pillar 94, on gravelly soil on ridge, only one example seen, fl. Dec. 20th 1937, *Beddington* 41. " Tree about 20 ft. high and 2 in. diam. Scores of flowers growing all along the branches. Sepals white. Petals rose, tips joined to sepals by white strings [i.e., claws] about $\frac{1}{4}$ in. long."

This outstanding species resembles the Colombian *A. stipularis* alone of all species presenting the floral characters of *Ayenia*, the general facies, owing to the shape and size of the glabrous leaves, being far nearer to that of certain species of *Byttneria*, especially *B. ancistroclada* Mildbr. and *B. myriantha* K. Schum. The floral characters place the material beyond doubt within the limits of *Ayenia* § *Cymbiostigma* as defined by K. Schumann in the *Pflanzenfamilien*. The curious " glands " on the midrib near the base of the lower surface of the leaves cannot be used as a clue for determining sterile material as referable to *Byttneria*, since they are sometimes developed in the Jamaican *Ayenia laevigata* Sw., as well as in *A. stipularis* and in the present new species. It should also be noted that, according to Triana and Planchon, the anthers of *A. stipularis* bear usually two, but sometimes three, thecae ; while Bentham and Hooker, in the *Genera Plantarum*, ascribed 2–3 thecae to the anthers of *Byttneria*. The presence or absence of a lamina arising from the petal-hood has vanished as a diagnostic character since the so-called ' gland ' formerly attributed to the hood of certain

species of *Ayenia* is now interpreted as a reduced lamina. We are thus left with the long filamentous petal-claw and the well-developed gynophore as distinguishing characteristics of *Ayenia* ; but these are short and inconspicuous in certain species, for example *A. magna* L. No doubt such plants as *A. stipularis* and *A. praeclara* are " bridge-species " between the two genera ; which is only another way of saying that they might well be united.

RUTACEAE

Spiranthera parviflora *Sandwith* sp. nov. ; a *S. odoratissima* St. Hil. atque *S. guianensi* Sandwith ob flores cum omnibus partibus suis minimos primo visu distinguenda ; praeterea ob formam dentium calycinorum necnon disci, antheras pilosulas notabilis.

Arbor parva ; ramuli cortice purpurascenti-nigrescente minute pubescente laccato costato praediti. *Folia* trifoliolata ; petiolus ramulis similis, 4·5–13 cm. longus ; petioluli laterales 3–7 mm. longi, terminalis 5–13 mm. longus ; foliola lanceolato-elliptica, oblanceolato-elliptica vel elliptica, apice conspicue (ad 2 cm.) acuminata, basi acute cuneata ac in petiolulos attenuata, 8–18 cm. longa, 3·3–7 cm. lata, chartacea vel tenuiter coriacea, supra siccitate nigrescentia, subtus ut in ceteris speciebus pallidiora brunnea, subtus minute satis dense adpresse pubescentia (cf. *S. guianensem*), nervis primariis utroque costae latere 10–12 exacte ut in ceteris speciebus arcuato-ascendentibus ac anastomosantibus. *Inflorescentia* forma generis thyrsoidea, ad 7 cm. longa, ad 5·5 cm. lata, ubique dense pubescens, floribus suaveolentibus apice ramorum satis crebis atque congestis ; pedicelli 2–4 mm. longi, velut calyces verruculis nigris punctati. *Alabastra* matura oblonga vel obovoideo-oblonga, circiter 6 mm. longa, indumento generis typico tomentosa. *Calycis* tubus brevissimus ; dentes conspicui, angusti, triangulari-lanceolati, 1·5 mm. longi. *Petala* alba, oblonga, obtusa, 8·3–9·5 mm. longa, ad 2·5 mm. lata. *Stamina* 5 perfecta, libera ; filamenta inferne pilosula, 6·5 mm. longa ; antherae circiter 2 mm. longae, minute pilosulae. *Ovarium* forma indumentoque ejus *S. odoratissimae*, brevissime stipitatum, 1·75 mm. diametro ; discus brevissimus, aperte cupularis margine undulato sed integro, 0·3 mm. altus, pallide brunneus, ovarii stipitem cingens, dentibus calycinis longe superatus ; stylus 2·5–3 mm. longus, verruculoso-glandulosus, inferne pilosulus. *Fructus* non visus.

BRITISH GUIANA. Brazilian boundary survey, Camp D, on hilltop on clay soil, fl. Oct. 1937, *Beddington* 23 (typus). " A small tree about 30 ft. high and 4 in. diam. Flowers white, in clusters, sweet-smelling. Unknown kind of Mamuriballi."

AMAZONIAN VENEZUELA. Rio Pacimoni, in wet forests, fl. Feb. 1854, *Spruce* 3444 : a small tree, 18 ft. high ; flowers white. According to a note on the label of the sheet in Herb. Benth. no more flowers were seen, and this is perhaps the only sheet of this number. It was referred by Bentham to the genus *Galipea*.

This interesting plant fits perfectly well into *Spiranthera* alongside of *S. odoratissima* and *S. guianensis* which it resembles closely in numerous characters of the leaves and inflorescence. The dissimilarity in the size of its flowers is very remarkable. The treatment of *Spiranthera* in the recent account of the *Rutaceae* in the *Pflanzenfamilien* (2 Aufl. **19**A, pp. 209, 283) requires emendation since Engler was unaware of the description of *S. guianensis*. The disk of the latter species, like that of *S. parviflora*, is short and entire on the margin, often undulate-sinuate, but not toothed. All three species exhibit the same bloom-like appearance on the lower surface of the leaflets.

S. guianensis *Sandwith* in Kew Bull. 1928, p. 368.

Additional collections are *Jenman* 6716, Demerara River; and *Forest Dept.* 2697, Portuguese Landing, Makauria Creek, Essequibo River, fl. and fr. June 1938. The latter collection was from a tree 30–40 ft. high, 12 in. diam.; bark like that of Mamuriballi; leaflets with a bloom on the lower surface; petals floppy, pale cream; stamens cream.

A new distinguishing character is afforded by the fruit, which was collected for the first time in *Forest Dept.* 2697. The carpels are roughly of the same shape and size as those of *S. odoratissima*, but are blackish and glabrescent, and more conspicuously transversely rugose; above all, the dorsal keel is terminated at the apex by a sharp triangular beak 4–5 mm. long and 2·5–3 mm. wide at the base. This sharp beak is in strong contrast with the short, rounded, inconspicuous appendage which terminates the dorsal keel of the carpels of *S. odoratissima*.

ROSACEAE

Hirtella macrosepala *Sandwith* sp. nov.; nulla affinitate manifesta, glabrescentia ramulorum inflorescentiaeque, foliis coriaceis oblongis basi leviter cordatis, inflorescentiis foliis brevioribus, racemis inferne compositis, bracteis bracteolisque conspicuis recurvis, floribus (praesertim sepalis) magnis, staminibus 6–7 distinguenda.

Arbor mediocris, ramulis annotinis griseo-cinnamomeis lenticellatis glabris, hornotinis angulatis superne parce pubescentibus. *Folia* oblonga, apice breviter (2–6 mm.) cuspidata, basi late rotundata atque leviter sed manifeste cordata, satis brevia, 6·5–13 cm. longa, 4–7 cm. lata, coriacea, utrinque nitidula, glabra nisi costa superne juventute sparse pubescente, siccitate brunneo-plumbea vel novella brunnea, nervis primariis utroque costae latere 7–10 patulis vel ascendentibus et longe a margine anastomosantibus, his cum costa supra tenuiter elevatis vel subplanis subtus prominentibus, rete venularum supra satis obscuro subtus elevato intricato; petiolus crassus, 3–6 mm. longus, supra pubescens. *Stipulae* subulatae, persistentes, 3·5–4 mm. longae, juventate pubescentes, demum coriaceae glabrae. *Inflorescentiae* axillares atque terminales, breves, foliis subtendentibus conspicue breviores, inferne saepius monochasialiter compositae, densiflorae, nonnunquam subcorymbosae,

vulgo 2·5–5 cm. longae, rarius ad 9 cm. longae, siccitate nigrescentes, glabrescentes sed ubique sparse subadpresse pubescentes ; pedicelli 8–10 mm. longi ; bracteae bracteolaeque rigidae, coriaceae, oblongae, obtusae, fere semper revolutae, 1·5–2·75 mm. longae, ad 1·3 mm. latae, apice tantum glandula sessili patelliformi terminatae. *Calycis tubus* campanulatus, 2–3 mm. longus, ad 2·75 mm. latus, glaber vel sparse pubescens ; lobi ovati vel elliptico-ovati, obtusi, 6–6·5 mm. longi, 3·5–4·5 mm. lati, extra marginibus exceptis sparse tantum pubescentes, intus tomentosi atque siccitate pallide flavi. *Petala* alba, oblonga vel ovato-oblonga, apice obtusa emarginata, basi breviter unguiculata, 7–8·3 mm. longa, 3·75–4·3 mm. lata. *Stamina* 6–7, filamentis glabris basi connatis 1·7 cm. longis basi albis apice puniceis *Ovarium* villosum ; stylus staminibus fere aequilongus, ad 1·85 cm longus, inferne conspicue pilosus. *Fructus* non visus.

British Guiana. Dukalikuru Creek, Berbice River, in mixed forest on brown sand, April 2nd, 1938, *Davis* in *Forest Dept.* 2631 : tree 60 ft. high, 8 in. diam., with very hard wood ; calyx lobes glossy green in bud, very much overlapping, when open concave, pale green, faintly pubescent ; petals waxy-white, erect ; stamens varying from white at base to crimson at top.

Melastomataceae (H. A. Gleason)

Leandra sanguinea *Gleason*, sp. nov. (Sect. *Secundiflorae*).

Frutex, caulibus juvenilibus 4-sulcatis densissime strigosis, pilis 1–2 mm. longis saepe curvatis. *Petioli* validi, usque 8 cm. longi, vel superne breviores, ad 3 cm., densissime breviterque strigosi. *Laminae* firmulae ovatae vel rhombo-ovatae, maximae 24 cm. longae 14 cm. latae, superiores sub panicula saepissime minores, abrupte acuminatae, integrae et ciliatae, basi late rotundatae, 9-nerviae supra pubescentes, pilis dimorphis, his subulatis 1 mm. longis, eis filiformibus satis brevioribus, subtus ad superficiem molliter cano-villosae ad venas purpureo-substrigosae, pilis circa 2 mm. longis. *Paniculae* 10–20 cm. longae, solitariae terminales, vel 3 vel 5, terminales et ex axillis superioribus, ramis simplicibus vel furcatis, patentibus, 2–4 cm. longis, secundifloris, ubique densissime sanguineo-substrigosae. *Flores* desiderantur. *Fructus* subglobosi, 3 mm. longi, dense strigosi ; semina obovoidea, 0·5 mm. longa, apicem versus granulosa.

British Guiana : sandy soil in dense forests of the Kaieteur gorge, altitude about 300 metres, Sept. 1937, *Sandwith* 1268 (typus in Herb. Kew.).

Few other species of the section exhibit strigose stems, and these are all small-leaved forms with smaller panicles and thinner indument. In general habit our plant is reminiscent of the common *L. dichotoma* (Don) Cogn. of the Cordilleran region, which may well be its closest relative, notwithstanding the marked difference in stem-pubescence. Dimorphic hairs are known for several species of the section.

Tococa desiliens *Gleason*, sp. nov. (Sect. *Anaphysca*).

Frutex vel arbor parva, ramis juvenilibus, petiolis, foliorum paginis, inflorescentiis et hypanthiis sparse glanduloso-hirsutis. *Rami* leviter complanati, mox glabri. *Petioli* 3–7 cm. longi. *Laminae* in quoque jugo saepe inaequales, ovato-oblongae vel elliptico-oblongae, usque 17 cm. longae, 11·5 cm. latae, superne subito contractae vel rotundatae in apiculum parvum, crenatae ciliataeque, basi late rotundatae, 5-nerviae, jugo exteriore submarginali. *Inflorescentia* erecta, inferne parce ramosa, ramis brevibus. *Flores* 5-meri, sessiles, 2–4 ramos terminantes vel 1–2 ad nodos superiores. *Hypanthium* anguste campanulatum, ad torum fere 6 mm. longum. *Calycis* tubus 1·3 mm. longus; sepala late triangularia, 0·4 mm. longa. *Petala* carnosa, obovata, valde inaequilateralia, 6·5 mm. longa. *Filamenta* glabra, 5 mm. longa. *Antherae* subulatae, 5·5–6 mm. longae, poro ventro-terminali dehiscentes, thecis basi brevissime productis, connectivo simplici. *Ovarium* 3-loculare, infra medium adnatum, superne truncato-conicum glabrum. *Stylus* 8·5 mm. longus, glaber, stigmate truncato.

British Guiana: in sandy forest skirting the Kaieteur Savannah, altitude about 400 metres, Sept. 1937, *Sandwith* 1426 (typus in Herb. Kew.) The petals were noted as "whitish-pink."

Notwithstanding its very different habit and its glandular pubescence, there can be little doubt that this plant is closely related to *Tococa nitens* (Benth.) Triana, while the two together form a species group quite apart from others in the genus. The relation is shown by the aspect of the leaves, the shape of the inflorescence, the sessile flowers, the shape of the sepals, the glabrous style and the truncate stigma. The species was collected more than fifty years ago in the same locality (*Jenman* 1049) and has remained unnamed in the Kew Herbarium.

Henriettea succosa (*Aubl.*) *DC.* var. **guianensis** *Gleason*, var. nov.; indumento et florum structura *H. succosae* (Aubl.) DC. similis, differt foliis multo minoribus basi cuneatis vix 3-pli-nerviis, paginae inferioris pilis dimidio minoribus, stylo sparsissime villosulo.

British Guiana: Mazaruni Station, in low bush on white sand, August 1937, *Sandwith* 1056 (typus in Herb. Kew.).

Leaves usually about 10 cm. long, 4 cm. wide, the largest only 13 cm. long. Petals pink. Anthers pale bluish-slate.

Rubiaceae

Cephaëlis nivea *Sandwith*, sp. nov.; *C. Altsoni* Sandwith affinis, foliis subtus cinereo-albis, involucris multo brevius pedunculatis, venatione bractearum involucri, calyce conspicue denticulato, corolla longiore, staminibus pro rata multo altius insertis differt.

Frutex humilis glaberrimus, ramulis summis 5–7 mm. latis. *Stipularum* vaginae supra petiolos 5–9 mm. longae, siccitate brunneae, ore truncato integro. *Folia* oblanceolata vel obovata vel elliptica, apice acute 0·5–1 cm. cuspidato-acuminata, basi acute

attenuato-cuneata, 18–23 cm. longa, 5·7–10·7 cm. lata, firme chartacea vel subcoriacea, supra siccitate griseoviridia vel brunnescentia, subtus et statu vivo et siccitate multo pallidiora cinereo-alba, venatione ei *C. Altsoni* simillima ; petiolus siccitate nigrescens, 1·2–2·5 cm. longus. *Inflorescentiae* terminales, solitariae ; pedunculus 2·5–3·8 cm. longus. *Involucrum* glabrum, ad 4 cm. longum, ad 5 cm. latum ; bracteae 4 ascendentes, carnosae, pulcherrime niveae, basi in tubum 1·5–2·5 cm. longum campanulatum connatae, tum late ovatae obtusae vel breviter late obtuse cuspidatae, 1·5–2·3 cm. longae, 1·5–2·5 cm. latae, nervis principalibus utroque costae latere 3–4 tantum ascendentibus rete venularum valde intricato connexis quam eis *C. Altsoni* minus numerosis atque minus approximatis. *Flores* numerosi, dense congesti ; pedicelli 2·5 mm. longi ; bracteae florum post pressionem haud rite visae, unica haud manca visa triangulari-ovata subulato-acuminata, circiter 2 mm. longa. *Calyx* 1 mm. longus, dentibus subulatis 0·5 mm. longis. *Corolla* nivea, limbo demum flavescente, glabra ; tubus 1·9 cm. longus, 1·5 mm. latus ; lobi ovati apice inflexo, 1·75 mm. longi, 1·75–2 mm. lati. *Stamina* 1·2 cm. supra tubi basin inserta, filamentis brevissimis ; antherae lineari-oblongae, 3 mm. longae. *Disci* glandulae 1 mm. altae. *Stylus* stigmatibus inclusis 8 mm. longus. *Fructus* ovoideo-oblongus, 5 mm. longus, 3–3·75 mm. latus, aliquantum costatus vel fere laevis, calyce fisso conspicue 5-lobato coronatus.

British Guiana. Potaro River, Amatuk portage, in shade of forest on sandstone, August 31st, 1937, *Sandwith* 1249 (typus) : low shrub ; leaves greyish-white beneath ; bracts fleshy, snow-white ; corolla snow-white, the limb turning yellow. *Ibid.*, Feb. 20th, 1879, *im Thurn.*

Psychotria kaieteurensis *Sandwith*, sp. nov. ; *P. cuspidatae* Bred. ex Willd. affinis, forma stipularum, foliis flavo-viridibus crassioribus magis ovatis basi latioribus magis rotundatis, lobis corollinis prope apicem gibbis vel cornibus nullis praeditis intus pubescentibus inferneque conspicue villosis differt.

Frutex, ramulis glabris flavo-viridibus superne compressis. *Stipulae* omnes nisi paris foliorum summi e vagina truncata integra viridi glabra ad 2 mm. longa 4–5 mm. lata constitutae ; stipulae foliorum in quoque ramulo summorum vagina utrinque bidentata, dentibus brevibus triangularibus ad 0·5 mm. longis circiter 0·5 mm. latis. *Folia* late ovata, apice conspicue argute acute acuminata, basi late rotundata lateribus basi ipsa paulo obliquis abrupte in petiolum cuneatum decurrentibus, 7–16·5 cm. longa, 5–10·2 cm. lata, oculo nudo glabra sed sub lente forti utrinque minutissime papilloso-puberula, firma, subcoriacea, flavoviridia, seniora siccitate olivacea, marginibus incrassatis, nervis supra prominulis subtus prominentibus, primariis utroque costae latere 10–11 arcuato-ascendentibus atque secus marginem anastomosantibus, secundariis crebris conspicuis subparallelis ; petiolus 5–10 mm. longus, glaber, supra canaliculatus subtus tereti-convexus. *Inflorescentia* viridi-

alba, siccitate flavescens, passim minute puberula, pedunculo 2·5–4 cm. longo, tum thyrso 2·5–3·5 cm. longo, basi ad 5 cm. lato ; rami imi oppositi, ceteri alterni, 1·2–1·75 mm. lati, cincinnatim composite brachiati ; bracteae basi brachiorum subfoliaceae, saepius concavae, ad 3·5 mm. longae et 2 mm. latae. *Flores* albi, secus brachia saepius apice ramulorum brevissimorum per paria sessiles. *Ovarium* glabrum, circiter 0·75 mm. longum. *Calycis* dentes breviter late deltoideo-triangulares, vix 0·2 mm. longi. *Corolla* 6–7 mm. longa, tubo sursum ampliato ac ibi ad 3 mm. lato extra puberulo intus circa et supra staminum insertionem villoso ; lobi ad 2·5 mm. longi, 1·3–1·75 mm. lati, extra fere glabri, intus et papilloso-puberuli et praesertim faucem versus dense conspicue villosi. *Stamina* paulo supra medium tubum inserta, filamentis glabris, antheris 1·75 mm. longis. *Discus* pulvinato-annularis, integer. *Stylus* floris longistyli fere 5 mm. longus, superne papillosus, ramis papillosis fere 2 mm. longis, floris brevistyli haud visus. *Fructus* ignotus.

British Guiana. Potaro River ; in sandy forests at the top of the Kaieteur Gorge, by the path descending from the Savannah to Tukeit, c. 1000 ft., Sept. 7th 1937, *Sandwith* 1429. A shrub with yellow-green leaves, greenish-white inflorescences and white corollas.

Psychotria bostrychothyrsus Sandwith sp. nov. ; ex affinitate, ut videtur, *P. paniculatae* (Aubl.) Raeusch., forma stipularum, inflorescentia maxima gracillima valde distincta ; quoad inflorescentiam *P. ramifloram* Rusby boliviensem simulans sed haec species ramis inflorescentiae primariis stricte oppositis, corollis extra tomentosis gaudet.

Frutex glaberrimus, ramulis summis compresso-subtetragonis. *Stipulae* triente inferiore connatae, late triangulari-ovatae, 5·5–7·5 mm. longae, basi ad 5·5 mm. latae, siccitate purpureo-brunneae, apice in lobos duos breves deltoideo-triangulares circiter 1 mm. longos fissae, eae foliorum terminalium breviores profundius fissae lobis apice subulato-acuminatis. *Folia* oblongo-lanceolata usque ovato-elliptica, apice conspicue (saepe ad 1·2 cm.) acuminata, basi cuneata usque rotundata, 14·5–24 cm. longa, 4·8–11 cm. lata, summa minora, chartacea usque fere subcoriacea, marginibus incrassatis, siccitate plerumque viridia vel olivacea, utrinque saepe crebre verruculoso-punctata, nervis primariis utroque costae latere 10–12 pulcherrime sursum arcuatis ac in margine ipso tantum secum conjunctis, his cum costa fere aequaliter prominentibus, nervis secundariis crebris subparallelis prominulis ; petiolus 1–3·5 cm. longus. *Inflorescentia* terminalis, pyramidali-thyrsoidea, glabra, gracillima, statu infructescente pendula brunneo-purpurea, pro genere magna valde florifera, pedunculo incluso 15–30 cm. longa, basi 11–16 cm. lata ; pedunculus infra ramos 5–9 cm. longus ; rami numerosi, alterni vel inferiores semiverticillati, vix unquam stricte oppositi, patentes, graciles, inferiores arcuato-flexuosi, superiores nonnunquam recti, omnes basi tumescentes et in axem decurrentes ebracteati, parte nuda inferiorum 3·5–5 cm. longa superiorum

gradatim breviore, apice partis nudae alternatim vel rarius opposite trichotomi ; ramuli ita orientes bis vel ter dichotome cymosi, flore terminali in dichotomia sessili, nonnunquam ob abortum alterius brachii dichotomiae sympodialiter cincinnati ; bractea basi trichotomiae oblongo-lanceolata, ad 3·5 mm. longa, ad 1 mm. lata ; cymulae ultimae semper uniflorae, floribus sessilibus, bractea subtendente 0·75–1·5 mm. longa. *Ovarium* glabrum, 0·8 mm. longum. *Calycis* lobi brevissimi, late triangulari-ovati, obtusi, circiter 0·2 mm. longi. *Corolla* alba, 4–6 mm. longa, extra glabra, tubo intus supra insertionem staminum conspicue piloso. *Stamina* in medio tubo inserta, filamentis glabris, antheris in flore brevistylo 2·2 mm. longis in flore longistylo 1·2 mm. longis. *Discus* annularis. *Styli* floris brevistyli rami filiformes 2 mm. longi, floris longistyli rami spathulati valde papillosi 1·75 mm. longi. *Drupa* albo-purpurea, globosa, matura 5–7 mm. diametro ; pyrena 3·75 mm. longa, 2·75 mm. lata, facie convexa 4-costata.

British Guiana. Anandabaru, Kopinang River, low ground in forest, 1800 ft., fl. April 1926, *Altson* 470 (typus) : shrub 4 ft. high ; upper surface of leaf finely pitted and with a velvety appearance ; corolla white. Potaro Road, fl. April 1899, *Jenman* 7509. In dark rocky forest in the gorge below the Kaieteur Falls, fr. Sept. 10th, 1937, *Sandwith* 1460 : shrub ; inflorescence pendulous, brownish-purple ; berry whitish-purple.

Psychotria (*Mapouria*, Sect. *Eumapouria*, Subsect. *Cephalanthae* Müll. Arg.) **deinocalyx** *Sandwith* sp. nov. ; a speciebus subsectionis affinibus limbo calycis valde evoluto late plicato-sinuato illum *Bellynkxiae calycinae* (Bth.) Brem. revocante statim distinguitur.

Frutex satis humilis, glaberrimus, ramulis teretibus. *Folia* elliptico-oblonga, obovato-oblonga vel oblanceolata, apice conspicue ad 1·5 cm. caudato-cuspidata, basi acute cuneata ac in petiolum ad 1·5 cm. longum decurrentia, 7·5–20 cm. longa, 2·8–6·2 cm. lata, glabra, chartacea, nervis primariis utroque costae latere circiter 13–15 patulis marginem versus arcuato-anastomosantibus, utrinque fere aequaliter reticulata. *Stipulae* apice ramulorum gemmam conicam apice barbatam exaristatam formantes ; vaginae vetustiores truncatae ore integro, supra petiolos 2·5–3 mm. longae. *Inflorescentia* capitulum terminale solitarium densiflorum 1–1·5 cm. diametro apice ramuli ita sessile vel fere sessile formans ut petioli foliorum summorum per flores capituli protrudant ; bracteae bracteolaeque obsoletae. *Flores* sessiles, pentameri. *Calyx* glaber, inferne cupulari-campanulatus, 2 mm. longus atque latus, tum abrupte in limbum chartaceum flavo-viridem plicato-sinuatum fere 2·5 mm. longum 6 mm. latum late ampliatus ; lobi limbi sinu brevi sejuncti, rotundato-obtusi, pinnatim nervosi atque laxe reticulati. *Corolla* pallide cremea ; tubus urceolato-cylindricus, apice contractus, 4·5–4·75 mm. longus, 2 mm. latus, extra glaber, intus prope faucem circa stamina basinque loborum zona dense lanata praeditus ; lobi patulo-ascendentes vel demum reflexi, valvati, ovato-lanceolati,

apice cucullati obtusi mucrone deorsum inflexo, 1·5–2 mm. longi, 1 mm. lati, extra glabri, intus pulverulento-tomentelli. *Stamina* prope apicem tubi inserta, filamentis albo-lanatis 0·5–1 mm. longis ; antherae lineari-oblongae, circiter 1 mm. longae. *Ovarium* biloculare, 1 mm. altum ; discus pulvinatus, circiter 0·5 mm. altus ; stylus glaber, circiter 2·2 mm. longus, stigmatibus 2 linearibus aliquantum papilloso-scaberulis 1·2 mm. longis ; ovula in quoque loculo solitaria, ascendentia. *Fructus* ignotus.

British Guiana. Berbice River : Kibihiu Creek, Wiruni River, in heavy bush fringing muri bush, Feb. 9th, 1938, *Fanshawe* in *Forest Dept.* 2638 : shrub 5 ft. high, with spreading lax growth ; calyx enlarged, pale yellow-green, papery ; buds and flowers pale cream ; corolla tubular, lobes reflexed, mouth closed with hairs.

Very distinct among members of this small group, which also includes *P. nudiceps* Standley. Described as a *Psychotria*, since the fruit is unknown and the group may not fall into *Mapouria* as recently restricted by Bremekamp.

Psychotria crocochlamys *Sandwith* sp. nov. ; *P. duidanae* Standl. ut videtur affinis, foliis longioribus, pedunculo breviore, radiis inflorescentiae 5, bracteis glabris, corolla aurantiaca breviore differt ; *P. calochlamys* Standl. etiam subsimilis inflorescentia pubescente, colore bractearum florumque roseo, corolla longiore recedit.

Frutex parvus sylvestris, nisi penes stipulas glaberrimus, ramulis tetragonis. *Stipularum* vagina ad 6 mm. longa, extra glabra, intus inferne villosa, siccitate purpureo-nigrescens margine pallide rubro-brunneo, haud dentata, margine truncato integro sed utroque ramuli latere sinu lato obtuso profunde fisso ; e sinibus vaginae ramuli cuiusque summae folia novella incipientia uninervia lanceolata acuta erecta ad 2 cm. longa ad 3 mm. lata evadunt. *Folia* oblongo-elliptica, elliptico-lanceolata vel rarius plus minusve oblanceolata vel obovato-elliptica, apice conspicue acute acuminata, basi attenuata et acute cuneata rarissime obtusa subrotundata, 7·5-19 cm. longa, 2·6–7·3 cm. lata, coriacea, siccitate flavo-viridia usque brunneo-olivacea, nervis primariis utroque costae latere 14–15 sursum arcuatis atque secus marginem anastomosantibus, secundariis multis interjectis per breve spatium subparallelis, costa utrinque prominente, nervis lateralibus supra prominulis vel planis vel impressis subtus cum secundariis venulisque prominentibus ; petiolus 0·5–1·8 cm. longus. *Inflorescentia* terminalis, glabra, siccitate nigrescens, pedunculo 2–9 cm. longo, tum radiato-thyrsoidea, ad 3·5 cm. longa, 3–6 cm. lata, radiis quinque 0·5–3 cm. longis apice capitulis latibracteatis terminatis radio terminali nonnunquam ramoso trifido ; radii basi nudi ebracteati, velut capitula statu vivo laete aurantiaco-flavi demum vinacei vel saturate purpurascentes. *Capitula* bracteis compluribus inaequalibus praedita ; bracteae exteriores ovatae vel ovato-ellipticae, acutae, glabrae, ad 2 cm. longae, ad 1·1 cm. latae, in multis inflorescentiis ad 9 mm. longae ad

7 mm. latae ; bracteae intimae oblongae, obtusae, 4 mm. longae, 1·2 mm. latae. *Flores* numerosi, sessiles, aurantiaco-flavi. *Ovarium* circiter 1 mm. longum. *Calyx* cupularis, glaber, 1 mm. longus, dentibus late triangularibus ad 0·4 mm. longis ad 1 mm. latis. *Corolla* cylindrica, longistyla tantum visa ; tubus 5–6·2 mm. longus, extra glaber, intus basi glaber, circa insertionem staminum zona pilorum praeditus, superne ubique aureo-papillosus ; lobi triangulares, ad 1·75 mm. longi, extra glabri, intus aureo-papillosi. *Stamina* infra medium tubum 2–3 mm. supra basin inserta ; antherae 2–2·5 mm. longae. *Discus* pulvinato-cupularis, integer. *Stylus* ad 6·5 mm. longus, lobis brevibus ovatis papillosis circiter 0·5 mm. longis. *Drupa* matura cinereo-alba, ovoideo-subglobosa, ad 1·2 cm. diametro.

British Guiana. Potaro River: Kaieteur Savannah, in fringing forest, c.1200 ft., Sept. 6th 1937, *Sandwith* 1390 (typus) ; *ibid.*, Sept.-Oct. 1881, *Jenman* 1251 ; *ibid.*, in forests descending to Tukeit, c. 900 ft., Sept. 1st 1937, *Sandwith* 1272 (type of fruit). Arabaroo Creek, 1863–1864, *Appun* 992. Forests north of Roraima near Caramang, 1838, *Robert Schomburgk* 31 of "last small set" in Herb. Benth.

A small shrub, up to about 1 metre high. Inflorescence and bracts bright orange-yellow, turning wine-coloured or dark purple with age. Buds yellow. Flowers orange, with yellow anthers (fide Schomburgk).

Palicourea roraimae *Standley* in Field Mus. Publ. Bot. **17,** 280 (1937), based on *Ule* 8765, is conspecific with **Psychotria oblita** *Wernham* (1914) and the species should not be regarded as a *Palicourea* since there is neither a unilateral swelling at the base of the corolla tube nor a woolly fringe of hairs within the tube near the base.

Apocynaceae (Robert E. Woodson, Jr.)

Mandevilla Sandwithii *Woodson*, sp. nov.

Fruticosa volubilis ; ramulis gracilibus teretibus pilosulis inferne glabratis ; *foliis* oppositis breviter petiolatis elliptico-lanceolatis apice acuminatis basi subcuneatis obtusis rotundatisve haud cordatis 10–13 cm. longis 4–5 cm. latis membranaceis supra viridibus glabris nervo medio sparse glanduligero subtus pallidioribus minute puberulis, petiolis 0·4–0·6 cm. longis minute pilosulis ; *inflorescentiis* lateralibus alternatis racemosis foliis multo brevioribus flores albidos 12–15 speciosos gerentibus ; pedunculo 4–6 cm. longo minute puberulo ; bracteis lanceolatis acuminatis 0·2–0·3 cm. longis subscariosis ; pedicellis 0·3–0·4 cm. longis puberulo-papillatis ; calycis laciniis ovatis anguste acutis 0·25 cm. longis subscariosis puberulo-papillatis squamellis oppositis triangularibus apice minute erosis ca. 0·1 cm. longis ; *corollae* infundibuliformis extra minute papillatae tubo proprio 2 cm. longo basi ca. 0·2 cm. diam., faucibus conico-tubulosis 2·5 cm. longis, ostio ca. 0·7 cm. diam., lobis oblique

obovatis ca. 1·3 cm. longis patulis ; *antheris* oblongo-sagittatis basi obtuse 2-lobatis 0·5 cm. longis dorso glabris ; *stigmate* umbraculiformi 0·3 cm. longe brevissime apiculato ; *ovariis* oblongoideis ca. 0·2 cm. longis glabris ; *nectariis* 5 compresse ovoideis basi concrescentibus ca. 0·15 cm. longis ; *folliculis* ignotis.

British Guiana : forests of gorge below Kaieteur Falls, Potaro River, Sept. 11th, 1937, *Sandwith* 1494 (typus in Herb. Kew.) : trailer over shrubs ; corolla creamy-white.

This species suggests *M. subspicata* (Vahl) Mgf., but I suspect that it is more closely allied to *M. sagittarii* Woods. because of the subtubular throat of the infundibuliform corollas. From the latter species, however, *M. Sandwithii* differs in the nearly glabrous corolla, subscarious bracts, and shape of the leaves, which is quite original for a *Mandevilla*. It is named to commemorate the painstaking floristic work of Mr. Sandwith in British Guiana.

Acanthaceae (C. E. B. Bremekamp)

Gynocraterium *Brem.* gen. nov. ; maxime ut *Staurogyne* Wall., sed ovulis paucioribus, stigmate crateriformi ab ea faciliter distinguenda.

Herba. *Folia* sine cystolithis. *Inflorescentia* spica terminalis densa, bracteis bracteolisque angustissimis et longissimis fimbriata. *Flores* ad nodos solitarii, bracteis subaequilongi. *Calyx* fere usque ad basin 5-partitus, lobo postico bracteolis persimili, trinervio, lobis aliis brevioribus et praesertim angustioribus, uninerviis. *Corolla* tubo longo, dimidio inferiore cylindrico, dimidio superiore infundibuliformi, limbo brevi, lobis orbicularibus subaequalibus, duobus superioribus in alabastro externis. *Stamina* 4, ad medium tubum inserta, inclusa ; antherae thecis ovoideis, basi minute apiculatis, connectivo brevi ; pollinis granula globosa fissuris tribus, sed sine poris germinativis. *Discus* cupularis parvus. *Pistillum* ovario tereti, apiculato, utroque loculo ovulis sex, stylo filiformi, stigmate crateriformi inclusum. *Capsula* nondum nota.

Species unica Guianam anglicam habitans.

Gynocraterium guianense *Brem.* sp. nov.

Herba ut videtur, erecta et simplex. *Caulis* 20 cm. altus, 3·5 mm. diam., ferrugineo-tomentosus, ultime glabrescens. *Folia* petiolo ferrugineo-tomentoso 1–2·5 cm. longo ; lamina lanceolata 9–14 cm. longa et 2·7–4·4 cm. lata, apice acuta an subacuminata, basi cuneata, margine subintegra subrevoluta, supra saturate et subtus dilute viridis, costa utrinque et nervis subtus primum ferrugineo-tomentosis, deinde glabrescentibus, nervis utroque latere costae 9–14, venulis paucis siccitate utrinque distinguendis. *Spica* sessilis, primum ovoidea, bracteis anguste linearibus 17 mm. longis et 1 mm. latis, acutis, bracteolis 20 mm. longis et 0·7 mm. latis, acutissime exeuntibus, sicut bracteis margine brevissime ciliatis. *Calyx* lobo postico 21 mm. longo et 1·2 mm. lato, lobis aliis 10–13 mm. longis et 0·5 mm. latis, omnibus margine breviter ciliatis.

Corolla tota 21 mm. longa, extra primum puberula sed mox glabrescens, intus glabra, tubo dimidio inferiore 1·3 mm. diam., dimidio superiore sensim usque ad 4 mm. dilatato, lobis 2·5 mm. longis. *Stamina* filamentis minute glandulosis 5–5·5 mm. longis, antheris thecis 0·9 mm. longis et 0·4 mm. latis, connectivo glanduloso ; pollinis granula 40μ diam. *Discus* 0·2 mm. altus, glaber. *Pistillum* 15·5 mm. longum ovario apicem versus puberulo 2 mm. alto et 0·8 mm. diam., stylo glabro, stigmate ad os 2 mm. diam. *Capsula* nondum nota.

British Guiana. Upper Essequebo, Mataruki River, *J. G. Myers* 5840 (typus in Herb. Kew.), fl. Dec. 6th 1935, in partially cleared rain-forest. The pollen grains are nearly all badly developed, and the finer structure is, therefore, difficult to make out.

I have coined the name *Gynocraterium* in analogy to *Staurogyne*.

Teliostachya mazarunensis *Brem.* sp. nov. ; cymis plerumque ad florem singulum reductis, pollinis granulis majoribus a congeneribus divergens, bracteis haud aristatis *T. surinamensi* Brem. et *T. medicagineae* Brem. similis, sed ciliis bractearum brevissimis ab eis faciliter distinguenda, a *T. gracili* Brem. cuius bracteae inaristatae sunt calycis lobis inaristatis recedens.

Herba 6–13 cm. alta. *Caules* basi repentes, quadricostati, glabri, cystolithis haud distinguendis, internodiis quam foliis brevioribus. *Folia* basi in pseudopetiolum usque ad 5 mm. longum contracta, praeterea anguste elliptica an lanceolata et 7–18 mm. longa et 4–8 mm. lata, obtusa, tenuia, glaberrima, nervis utroque latere costae tribus, supra cystolithis cylindricis interdum conspicue lineolata. *Inflorescentia* spica cylindrica haud confluens, 1–2·5 cm. longa et 6–7 mm. diam., axi in costis conspicue ciliata ; cymae plerumque ad florem singulum reductae, bracteis obovatis, infimis 6 mm. longis et 2·2 mm. l. tis, apicem spicae versus usque ad 3·5 mm. longis et 1·6 mm. latis decrescentibus, acuti- et callosomucronulatis, trinerviis, haud ciliatis ; bracteae florum lateralium rariorum lineares, subobliquae, 2·5–3 mm. longae et 0·5–0·6 mm. latae, acutissimae, uninerviae, haud ciliatae ; bracteolae bracteis florum lateralium similes. *Calyx* lobo postico lanceolato 5 mm. longo et 1·4 mm. lato, in cuspidem 0·3 mm. longam exeunte, trinervio, basin versus brevissime ciliato ; lobis lateralibus anguste triangularibus 3·5 mm. longis et 0·5 mm. latis, uninerviis, acutissimis, brevissime ciliatis ; lobis anticis linearibus 4 mm. longis et 0·6 mm. latis, subobliquis, uninerviis, acutissimis, brevissime ciliatis. *Corolla* alba, labio inferiore tamen rubro-maculato, tota 5·7 mm. longa, glabra ; tubo 2·2 mm. longo et 0·9 mm. diam., fauce glabro ; labio superiore lanceolato obtuso, subintegro ; labio inferiore lobis oblongis obtusis 2·2 mm. longis. *Stamina* 0·2 mm. sub divisura corollae inserta, filamentis glabris 1·3 et 2 mm. longis, antheris 0·4 mm. altis, thecis 0·3 mm. altis, basi vix apiculatis ; granula pollinis 42μ longa et 28μ diam. *Discus* cupularis, margine incisa, facie antica in lobum ovoideum ovario dimidio breviorem productus. *Pistillum* ovario

apice piloso, 0·7 mm. alto, stylo glabro 3 mm. longo. *Capsula* nondum nota.

British Guiana. Mazaruni River; Kartabo, *Sandwith* 1545 (typus in Herb. Kew.), fl. Sept. 17th 1937. On muddy river bank, creeping. Upper lip of corolla nearly white, lower blotched with pinkish-purple.

Hygrophila Sandwithii *Brem.* sp. nov.; calycis lobis hirtellis ad *H. guyanensem* N. ab E. et ad *H. surinamensem* Brem. accedens, ab utraque specie corolla extra glabra, staminibus basi liberis distincta, floribus solitariis *H. surinamensi* similior, forma corollae et sculptura pollinis granulorum tamen ad *H. guianensem* vergens.

Herba semi-aquatica, 20–25 cm. alta, basi decumbente et radicante. *Caules* obtuse quadrangulares, sulcati, angulis et lineis interpetiolaribus interdum fimbriatis, cystolithis haud conspicuis. *Folia* sessilia lineari-lanceolata 2·5–5·5 cm. longa et 0·5–1·0 cm. lata, obtusa, supra glabra, subtus costa nervisque pilis crassis ciliata, cystolithis cylindricis praesertim supra densius lineolata. *Flores* axillis foliorum solitarii, subsessiles, bracteolis spathulatis 7 mm. longis et 1·5 mm. latis margine dense ciliatis praecessi. *Calyx* fere usque ad basin in lobos 5 aequaliter partitus; lobi anguste lineares 6 mm. longi et 0·5–0·7 mm. lati, margine dense ciliati, costa hirtelli. *Corolla* dilute violacea, tota 8·5–9 mm. longa, extra glabra; tubo 6 mm. longo, dimidio inferiore cylindrico, dimidio superiore infundibuliformi; labiis 3 mm. longis, superiore apice in lobulos 1·2 mm. longos exeunte, inferiore in lobos tres 2·2 mm. longos partito. *Stamina* longiora ad medium tubum inserta, breviora ad apicem tubi; staminodium clavato-filiforme 0·6 mm. longum inter stamina breviora insertum; staminum filamenta basi libera, 3·8 et 1·5 mm. longa, basin versus dilatata et breviter ciliata; antherae apice obtusae 1·1 et 0·7 mm. longae, staminum breviorum interdum thecis valde inaequalibus; granula pollinis punctatione et fissurarum numero granulis *H. guianensis* similiora, fissuris subaequalibus granula *H. surinamensis* imitantia. *Discus* annularis parvus, glaber. *Pistillum* ovario glabro 1·8 mm. alto, utroque loculo ovulis sex, stylo glabro 6·0–6·7 mm. longo, stigmatis lobo antico filiformi 0·8 mm. longo, lobo postico minuto. *Capsula* nondum nota.

British Guiana. Mazaruni Station, *Sandwith* 1546 (typus in Herb. Kew.), fl. Sept. 18th 1937: creeping herb on sandy and muddy river bank; corolla mauve.

Fruits are entirely absent, though withered flowers are not rare. As the plants are entirely coated with mud, they have apparently been exposed to the influence of the tides, and pollination therefore may have been difficult. The pollen grains which I have seen were empty and badly developed, but this may be due to the fact that they were taken from open flowers, in which the anthers had already shed the greater part of their pollen; buds in the right state of development were not present.

Noteworthy features of this new species are the free filaments and the presence of a staminodium : in the other species the filaments are united at the base in pairs, and a sterile fifth stamen has not yet been observed.

Duvernoia potarensis *Brem.* sp. nov. ; a speciebus africanis calycis lobis longioribus, angustissime triangularibus, spica secunda longa, bracteolis bracteis subaequalibus distincta.

Herba simplex, 7–17 cm. alta, basi decumbente et radicante. *Caulis* obtuse quadrangularis et bisulcatus, pilis recurvatis dense pubescens, 1 mm. diam., cystolithis inconspicuis. *Folia* petiolo 3–5 mm. longo, pilis incurvatis dense pubescente ; lamina elliptica an oblonga, 2·3–5·5 cm. longa et 1·3–1·8 cm. lata, subacuta an subacuminata, basi acuta, supra pilis robustioribus paucis, subtus costa densius, nervis margineque sparse pubescens, siccitate haud conspicue decolorata, costa nervisque subtus albidis, nervis utroque latere costae plerumque 5, cystolithis cylindricis subtus haud faciliter distinguendis. *Spicae* terminales et interdum axillares, laxae, secundae, ultime longissimae, dense glanduloso-pubescentes, pedunculo circiter 10 mm. longo, floribus ad nodos solitariis, bracteis decussatis anguste linearibus an spathulatis 5–8 mm. longis et 0·6–1·5 mm. latis, acutis, uninerviis, dense glanduloso-hirtellis ; bracteolis bracteis subaequalibus. *Calyx* usque ad basin partitus, lobis 5 subaequalibus angustissime triangularibus et acutissime exeuntibus, dense hirtellis, 4·5–5 mm. longis et 0·3 mm. latis. *Corolla* dilute violacea, 12 mm. longa, extra breviter pubescens ; tubo cylindrico 5 mm. longo et 1·8 mm. diametro ; labiis 7 mm. longis, superiore triangulari, ad basin 4 mm. lato, apice vix conspicue bidentato, recto, inferiore in lobos tres orbiculares obtusos 3 mm. longos fisso. *Stamina* 0·6 mm. infra incisuras corollae inserta, filamentis glabris 5 mm. longis, antheris thecis subaequilongis 1 mm. longis, connectivo late separatis, inferiore basi calcari 0·5 mm. longo munita, superioris dimidium attingente ; granula pollinis ellipsoidea 32μ longa et 22μ diam., tripora, poris in fissuris longitudinalibus, utroque latere fissura aequilonga comitatis, superficie inter fissuras minute punctata. *Discus* cupularis tenuis, 0·4 mm. altus. *Pistillum* ovario apice puberulo 2 mm. alto, stylo glabro 9 mm. longo, stigmate parvo punctiformi. *Capsula* dense pubescens, 8·5 mm. longa, stipite 3 mm. longo comprehenso ; valvulis biseminalibus. *Semina* lenticularia ovoidea, basi inaequalia, 2·3 mm. alta, 2·0 mm. lata, brunnea, pilis brevissimis patentibus muriculata.

British Guiana. Potaro River, above Kaieteur Falls, alt. 360 m., *Sandwith* 1418 (typus in Herb. Kew.), fl. and fr. Sept. 7th 1937. Small herb, on damp sandy path in forest. Corolla lilac-mauve.

var. **tetrapora** *Brem.* var. nov. ; a typo foliis majoribus, usque ad 7·5 cm. longis et 4 cm. latis, nervis subtus haud albidis, sed praesertim granulis pollinis tetraporis, 38μ longis et 25μ diam. diversa.

British Guiana. Below the Kaieteur, *Jenman* 960 (typus in Herb. Kew.), fl. and fr. Sept.-Oct. 1881.

It looks almost as if this variety might be a polyploid form of the type.

It has been said that apart from the pollen grains *Duvernoia* and *Justicia* are indistinguishable. For this reason, in the Floras of South and Tropical Africa, the genus *Duvernoia* was sunk by Clarke in *Justicia*. Lindau duly mentions Clarke's standpoint in Engler and Prantl, Nachträge III. p. 325, without, however, expressing an opinion. The question of the status of the plants reckoned by Lindau to *Duvernoia* is, nevertheless, from a taxonomic point of view, of great importance. On account of the structure of the pollen grains *Duvernoia* has been placed in the *Odontonemeae*, whereas *Justicia*, of course, belongs to the *Justicieae*. If *Duvernoia* is sunk in *Justicia*, the *Odontonemeae* and the *Justicieae* therefore will have to be united too. That these tribes are nearly related can hardly be denied ; it might even be right to regard the *Justicieae* as a subtribe of the *Odontonemeae*. When we see, however, that elsewhere in the *Acanthaceae* differences in the pollen characters are always correlated with differences in other characters, the absence of such a correlation here does not look convincing ; it is quite possible that subsequent investigations will reveal its presence.

The similarity between *Duvernoia* and *Justicia* is itself perhaps not so great as has been supposed. One should not overlook that the genus *Justicia* as delimited by Lindau contains very heterogeneous elements, and that its diagnosis accordingly is very vague. The characters of the pollen grains are already, as a glance at plate XVI of my " Notes on the Acanthaceae of Surinam " (Rec. Trav. Bot. Néerl. **35** (1938)) will reveal, by no means very uniform ; the presence of two germ pores is about the only character in which they agree, and even this character is not universal, for in *J. Gendarussa* L. and its allies Lindau mentions the presence of three pores. The only other characters in which all the species agree are the presence of but two stamens, the insertion of the anther lobes at unequal height, and the stipitate capsule with one or two ovules per valve. These characters, however, are found in other genera too, and that they are present in *Duvernoia* proves, therefore, very little. When the genus *Justicia* has been split up into more natural groups, it will doubtless appear that even apart from the pollen characters none of them agree fully with *Duvernoia*.

Xyridaceae (J. Lanjouw)

Xyris dolichosperma *Lanj.* in Rec. Trav. Bot. Néerl. **34,** 488, f. 5 (1937).

By stream in burnt bush fringing the Kaieteur Savannah, c. 1200 ft., Sept. 6th 1937, *Sandwith* 1397. Petals yellow.

Distr. Surinam. First record for British Guiana.

Very poor material, with rather short leaves, but the characters of the bracts, sepals and seeds (rather young) are well-marked.

X. subuniflora *Malme.*

Kaieteur Savannah, forming dense little tussocks on sandy ground, c. 1200 ft., Sept. 5th 1937, *Sandwith* 1373. Stems brownish. Leaves red.

Distr. Surinam. First record for British Guiana.

X. Uleana *Malme.*

Kaieteur Savannah, in damp sand, Sept. 7th 1937, *Sandwith* 1422; *ibid.*, Sept.-Oct. 1881, *Jenman* 1253. Peduncles flattened. Petals yellow.

Distr. Surinam, Amazonian Brazil.

var. **angustifolia** *Lanj.*, var. nov.; a planta typica foliis angustioribus (latitudine 0·8 mm. haud attingente), pedunculo subtereti leviter bicostato (haud alato) differt.

British Guiana. Kaieteur Savannah, in damp sand, c. 1200 ft., Sept. 7th 1937, *Sandwith* 1421 (typus in Herb. Kew.); *ibid.*, Aug. 20th 1933, *Tutin* 497. Petals deep orange-yellow.

Differs from the species by its narrow leaves (less than 0·8 mm. broad) and the subterete, slightly bicostate (not alate) peduncle.

Abolboda americana (*Aubl.*) *Lanj.* l.c. 492.

Kaieteur Savannah, in damp sand and boggy places, c. 1200 ft., Sept. 1937, *Sandwith* 1306, 1424. Growing in dense tufts. Petals pale blue.

Distr. Guiana, Amazonian Brazil. Previously unrepresented at Kew.

Cyperaceae

Rhynchospora arenicola *Uitt.*, det. Uittien.

Kaieteur Savannah, in damp sand, c. 1200 ft., Sept. 7th 1937, *Sandwith* 1423. Spikelets pale greenish-brown.

Distr. Surinam. First record for British Guiana.

R. curvula *Griseb.*

Kaieteur Savannah, bare stony ground, local, c. 1200 ft., Sept. 9th 1937, *Sandwith* 1445. Stems and leaves delicate. Spikelets green. Stigmas 3.

Distr. Trinidad, Guiana. First record for British Guiana.

Diplacrum notopterum (*Nees*) *C. B. Cl.* in Kew Bull. Add. Ser. **8,** 62 (1908).—*Scleria notoptera* Nees in Linnaea, **9,** 303 (1835); Kunth, Enum. **2,** 359 (1837). *Pteroscleria gujanensis* Nees in Mart. Fl. Bras. **2,** pars 1, 196 (1842). *Diplacrum longifolium* (Griseb.) C. B. Cl. var. *laevissimum* Kük. in Engl. Jahrb. **56,** Beih. 125, p. 23 (1921). *D. laevissimum* (Kük) Uittien in Pulle, Fl. Suriname, **1,** 149 (1934).

Distr. Guiana, Rio Branco.

The type of *Scleria notoptera* Nees ("Guiana, Hooker") has been borrowed from the Lindley Herbarium in the Herbarium of Cambridge University and proves to be conspecific with the plant known as *Diplacrum laevissimum*, agreeing perfectly with—and

possibly being part of—a collection of Parker from British Guiana in Herb. Hooker in the Kew Herbarium. Recent authors have misinterpreted Nees' plant, presumably owing to a mistake in his description of *Pteroscleria gujanensis*: "folia $\frac{1}{2}$–$\frac{3}{4}$ poll. longa" should, no doubt, read "folia $\frac{1}{2}$–$\frac{3}{4}$ ped. longa."—N.Y.S.

LX—THE GENUS PYCNOSTACHYS. E. A. Bruce.

The genus *Pycnostachys* (1) was described by W. J. Hooker (2) in 1825, and was based on the single species, *P. coerulea*, from Madagascar. In 1838 Fresenius (3) added another species, *P. abyssinica* (Abyssinia), and in 1848 Bentham (4) reduced E. Meyer's monotypic genus *Echinostachys* (5) to *Pycnostachys*, transferring *E. reticulata* to *Pycnostachys*, and at the same time describing a new variety, *P. reticulata* var. *angustifolia*. Later Bentham and J. D. Hooker (6) amplified the original generic description to include a further species, *P. urticifolia*, making in all four species and one variety, though they stated, apparently erroneously, that the genus included six species. Before the end of the century a further twenty species were published, mainly by Gürke,(7) though Baker (8) and Briquet (9) also contributed to their number. It was not, however, until 1900 that an attempt was made by Baker (10) to classify and make an artificial key to the Tropical African species. He recognized thirty-four species, including eleven new ones. In the next twenty-one years a further thirteen species were described by various authors, but no revisional work was done on the genus until 1921, when Miss Janet Perkins (11) published a paper on "The African Species of Pycnostachys." Miss Perkins revised the concept of a number of existing species and published eight new ones, recognizing in all thirty-three species. In the same year, but two months earlier De Wildeman,(12) unknown to Miss Perkins, published four new species and seven years later added another nine, all described from the Belgian Congo and the Ruwenzori area. From this date to the present day six species have been described by different authors but no further attempt has been made at classification. Thus, since the foundation

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(1) πυκυός dense, στάχυς spike.
(2) Hooker, Exot. Fl. **3,** t. 202 (1825).
(3) Fres. in Flora, **2,** 608 (1838).
(4) Benth. in DC. Prod. **12,** 83 (1848).
(5) E. Mey. Comm. Pl. Afr. Austr. 243 (1837).
(6) Benth. & Hk. f. Gen. Plant. **2,** 1177 (1876).
(7) Gürke in Engl. Hochgeberge Fl. Trop. Afr. 362 (1892) et in Engl. Bot. Jahrb. **22,** 145 (1895) et in Pflanzenw. Ost-Afr. **C,** 345 (1895).
(8) Bak. in Kew Bull. 1895, 71, 72, et 1898, 161, 162.
(9) Briq. in Engl. Bot. Jahrb. **19,** 191 (1894) et in Bull. Soc. Bot. Belg. **37,** 63 (1898).
(10) Bak. in Dyer Fl. Trop. Afr. **5,** 378 (1900).
(11) Perk. in Notizbl. Bot. Gart. Berlin, **8,** 63 (1921).
(12) De Wild. Contrib. Fl. Katanga, 171 (1921) et Pl. Bequaert. **4,** 386 (1928).

of the genus in 1825, seventy-seven specific names have been validly published.

In the past, workers have taken very narrow views of specific variation within the genus, and consequently many of the specific descriptions amount to nothing more than descriptions of individual plants. An examination of the large amount of material collected in recent years has been made, together with a careful scrutiny of all the available type specimens. From this study the species appear to vary within rather wide limits, and it is probable that cytologically they are in an unstable condition. It has been found that in order to produce a usable classification a broad view of specific variation has to be taken, and this has resulted in many of the existing species being reduced to synonymy. Within the species the variation in indumentum and leaf-shape and size is often very marked and in addition, plants, when in different stages of development, vary greatly, and consequently are difficult to compare.

The species are here arranged, as much as possible according to their affinities, in six groups. A key has been made to these groups and also to the species under each group. It will be noticed that in these keys a species sometimes appears in more than one group. This is to ensure that plants will key out correctly, as it is difficult to obtain satisfactory key characters. The group to which the species belong will be found by reference to the list of groups preceding the key (p. 566).

Thirty-seven species are here recognized, including one new combination. A few specimens have not been accounted for, and it is possible that some of these may be new. They have not, however, been described, as it was thought to be unwise to add further new species without adequate material.

The complete geographical range of the genus is : French Guinea eastwards through the Cameroons to the Sudan and Abyssinia, then south through East Africa to the Cape ; also in Angola and Madagascar (see maps pp. 568–579 and table of distribution p. 565).

Pycnostachys is usually found in damp places or on stream banks, and the species are generally annual or perennial herbs, though some are undershrubs.

The genus is well defined and is characterized by the dense inflorescence and spine-like teeth of the calyx in fruit. It belongs to the tribe *Ocimoideae* and is most closely related to *Coleus* and *Plectranthus*, the connecting link being *Pycnostachys umbrosa*, which has a comparatively loose inflorescence, though it has the characteristic spiny calyx-teeth of the genus. This species was originally described by Vatke under *Coleus* but was later transferred to *Pycnostachys* by Miss Perkins.

In addition to the material in the Kew Herbarium specimens have been examined at the British Museum (Natural History), and a number of specimens have been received on loan from Amani, Berlin, Brussels, Paris, Stockholm, Uppsala and Zürich. I am indebted to the Directors of these institutions for the facilities afforded.

Distribution of *Pycnostachys*

Species	French Guinea	Gold Coast	Dahomey & Togo	British Cameroons	Cameroons	Oubangi-Chari	Sudan	Abyssinia	Belgian Congo	Uganda	Kenya	Tanganyika	Angola	N. Rhodesia	Nyasaland	Portuguese East Africa	S. Rhodesia	S. Africa	Madagascar
1. *graminifolia*												×							
2. *verticillata*												×							
3. *De Wildemaniana*												×							
4. *linifolia*												×							
5. *Pritzelii*												×							
6. *parvifolia*												×							
7. *Descampsii*												×							
8. *pallidè-caerulea*				×					×			×			×				
9. *orthodonia*												×							
10. *gracilis*												×	×						
11. *ruandensis*									×			×							
12. *congensis*									×			×		×	×		×		
13. *Kassneri*									×			×		×	×		×		
14. *coerulea*									×			×		×	×		×		
15. *deflexifolia*												×							
16. *niamniamensis*												×							
17. *pseudospeciosa*									×			×							
18. *nepetifolia*												×							
19. *Chevalieri*						×						×							
20. *reticulata*												×							
21. *Schweinfurthii*							×		×	×		×		×					
22. *Stuhlmannii*												×							
23. *speciosa*												×							
24. *sphaerocephala*												×							
25. *angolensis*												×	×						
26. *Perkinsii*												×							
27. *Whytei*												×							
28. *Elliottii*												×							
29. *Batesii*					×							×							
30. *umbrosa*												×							
31. *Eminii*												×							
32. *Erici-Rosenii*												×							
33. *urticifolia*												×							
34. *abyssinica*								×				×							
35. *Goetzenii*												×							
36. *Schliebenii*												×							
37. *Meyeri*	×			×					×			×							

List of Groups

Group 1.	Group 2.	Group 3.	Group 4.	Group 5.	Group 6.
1. graminifolia	9. orthodonta	14. coerulea	24. sphaerocephala	28. Elliottii	29. Batesii
2. verticillata	10. gracilis	15. deflexifolia	25. angolensis		30. umbrosa
3. DeWildemaniana	11. ruandensis	16. niamniamensis	26. Perkinsii		31. Eminii
4. linifolia	12. congensis	17. pseudospeciosa	27. Whytei		32. Erici-Rosen
5. Prittwitzii	13. Kassneri	18. nepetifolia			33. urticifolia
6. parvifolia		19. Chevalieri			34. abyssinica
7. Descampsii		20. reticulata			35. Goetzenii
8. pallide-caerulea		21. Schweinfurthii			36. Schliebenii
		22. Stuhlmannii			37. Meyeri
		23. speciosa			

Key to Groups

Leaves whorled or if opposite appearing fasciculate, linear, linear-lanceolate, spathulate, oblanceolate-cuneate or if lanceolate under 3 cm. long and fasciculate (*P. parvifolia*).....**Group 1.**

Leaves opposite (rarely whorled or appearing fasciculate, if so not of a linear type), linear-lanceolate, lanceolate, oblanceolate, oblong-lanceolate, ovate-lanceolate, ovate, obovate, elliptic or broadly ovate :

Annuals with thin, flaccid, glabrous or, on the nerves below thinly pubescent, linear-lanceolate, lanceolate, ovate-lanceolate, ovate or broadly ovate leaves; stems definitely quadrangular, never rounded, sulcate, succulent or woody, unbranched below and generally branched towards the top.....**Group 2.**

Plants generally perennial herbs or undershrubs; stems quadrangular or often rounded, striate, woody or succulent; if annual then leaves not thin and flaccid :

Leaves sessile or subsessile, lower ones at most 0·5 cm. petiolate :

Leaves generally glabrous or thinly puberulous on the nerves below, if thinly pubescent below then, either flowers less than 1 cm. long, or leaves sessile, or leaves elongate-lanceolate and acuminate : (leaves varying from linear-lanceolate to elliptic, rounded or acuminate at the apex).....**Group 3.**

Leaves thinly pubescent to tomentose over the lower surface, sometimes becoming pubescent on nerves only, lanceolate or oblong-lanceolate, serrate or crenate-serrate, acute or subacute at the apex, scarcely acuminate, subsessile or very shortly petiolate; flowers large over 1 cm. long, generally 1·3 cm. or over.....**Group 4.**

Leaves definitely petiolate ; lower petioles at least 1 cm. :
Flowers large, 1–2 cm. long, with long-exserted stamens, 3–6 mm. beyond the lower-lip ; corolla with a short 1 mm. long upper-lip ; narrow cylindric portion of tube 2 mm. long, about a third the length of the 6 mm. long funnel-shaped portion, which is 4 mm. diameter at the throat ; bracts lanceolate ; spikes generally solitary 5–8 cm. long and about 2·5 cm. broad in fruit, 3–6 cm. pedunculate.....**Group 5.**
Flowers variable in size, 0·5–2·5 cm. long, stamens not long-exserted ; narrow cylindric portion of tube at least half the length of funnel-shaped portion, generally sub-equal to it or longer ; bracts, spikes and leaves variable in size and shape.....**Group 6.**

Key to Species

Group 1.

Stems and leaves with a few scattered long white hairs ; leaves sessile, grasslike, generally in whorls of fours, 3–6 cm. long, and about 2 mm. broad ; fruiting spikes solitary, 2–5 cm. long and about 1·5 cm. broad ; base woody.....**1. graminifolia**
Stems and leaves with short, comparatively close, crisped, appressed or subscabrid pubescence ; leaves not grasslike :
Flowers small, about 5 mm. long, lower-lip of corolla shallow, not deeply boat-shaped ; fruiting spikes narrow about 1 cm. in diameter :
Leaves spathulate, shortly petiolate, 1–4 cm. long, pubescence of stem crisped and spreading, not closely appressed ; calyx-teeth short, 1–2 mm. long in flower and young fruit, pubescent or puberulous.....**2. verticillata**
Leaves ± flaccid, linear or linear-lanceolate, subsessile, 2–9 cm. long ; pubescence of stem closely appressed, not spreading ; calyx-teeth more than 2 mm. long, glabrous or glandular, not pubescent, calyx-tube in flowering stage and young fruit thinly hirsute and glandular...**3. De Wildemaniana**
Flowers larger, 8 mm. long or over, lower-lip of corolla deeply boat-shaped ; fruiting spikes broader than above (1–5 cm. or over) :
Stems quadrangular or occasionally ± rounded, not conspicuously sulcate :
Leaves thin ± flaccid, linear-lanceolate, shallowly toothed, 3–10 cm. long, 0·3–1 cm. broad ; indumentum of stem subscabrid ; fruiting spikes 1·5–2 cm. diameter.....**Schweinfurthii**
Perennial herbs with firm, ± leathery, linear, spathulate, lanceolate, oblong-lanceolate or oblanceolate leaves, 0·5–5 cm. long and up to 0·6 cm. broad ; indumentum soft or subscabrid :


GROUP 1.
1. P. graminifolia
2. P. verticillata
3. P. DeWildemanniana
4. P. linifolia
5. P. Prittwitzii
6. P. parvifolia
7. P. Descampsii
8. P. pallidecaerulea

Leaves linear, spathulate or oblanceolate 2–5 cm. long; indumentum of lower surface of leaf soft:

Bracts linear, less than 1 mm. broad at the base, not forming a conspicuous coma at the apex; leaves sessile, linear or spathulate, up to 3 mm. broad, some at any rate in whorls; calyx teeth 3–4 mm. long, pubescent; corolla pubescent; indumentum of stem ± crisped not very closely appressed..... **4. linifolia**

Bracts linear-lanceolate, long acuminate, about 2 mm. broad at the base, forming a conspicuous coma at the apex; leaves narrowly oblong to narrowly oblanceolate, up to 6 mm. broad; indumentum of stem very short and closely appressed..... **5. Prittwitzii**

Leaves lanceolate or oblong-lanceolate, generally appearing densely fasciculate, 0·5–3 cm. long, conspicuously punctate and subscabrid on the nerves below..... **6. parvifolia**

Stems conspicuously sulcate (6–10 ribbed); leaves linear or oblanceolate appearing fasciculate; calyx-teeth thinly pubescent or pilose:

Spikes generally solitary; bracts conspicuous in flower, linear, about 1 cm. long, ciliate; corolla densely papillose or crisped pubescent on the lip, not glandular; leaves up to 5 cm. long (Congo)..... **7. Descampsii**

Spikes generally many; bracts not conspicuous in flower; corolla sparsely pubescent, glandular; leaves up to 3 cm. long (British Cameroons)..... **8. pallide-caerulea**

The plants within this group form a fairly natural assemblage. They are characterized by the whorled or apparently fasciculate arrangement of the leaves, which are of a linear type. The only doubtful species which occur here are *P. De Wildemaniana*, *P. Schweinfurthii* and *P. Prittwitzii*. The two former have been inserted in Groups 2 and 3, whilst the latter is related to *P. niamniamensis* in Group 3, but is distinguished from it by the narrow, oblanceolate leaves.

Group 2.

Leaves long (2–5 cm.) petiolate, ovate or broadly ovate; flowers comparatively large, 1–1·5 cm. long:

Fruiting spikes short and broad, about 3 cm. long and 2·5 cm. broad; flowering spikes comparatively narrow 1–1·5 cm. broad; calyx-tube in fruit conspicuously inflated below and contracted at the throat, teeth glabrous, 3 mm. long in flower and fruit, spreading and thickened in fruit; leaves very coarsely crenate, 5–7 teeth on each side, rounded or truncate at the base; lamina 5–8 cm. long, 2–5 cm. broad, glabrous ..... **Batesii**

Fruiting spikes narrow, elongate, 3-16 cm. long, 1–2 cm. broad ; calyx-tube not conspicuously inflated below, teeth shortly puberulous or pubescent, 4–8 mm. long, ± erect and needle-like ; leaves cuneate at the base, crenate or crenate-dentate with more than 7 teeth on each side.....**9. orthodonta**

Leaves sessile or subsessile, if long-cuneate at the base, often shortly petiolate, linear-lanceolate, lanceolate, ovate-lanceolate or ovate :

Flowers small, 4 to 7 mm. long ; lower lip of corolla shallow, not deeply boat-shaped :

Calyx in fruit not at all contracted and hooded at the throat, tube often glandular or hirsute, teeth straight, glabrous or sparingly glandular or puberulous, never long-ciliate ; spikes narrow, in fruit about 1 cm. diameter ; leaves sessile, or subsessile, linear-lanceolate or lanceolate, 2–12 cm. long, 0·4–3 cm. (though rarely over 1 cm.) broad :

Calyx-teeth in fruit 1·5–3 mm. long :

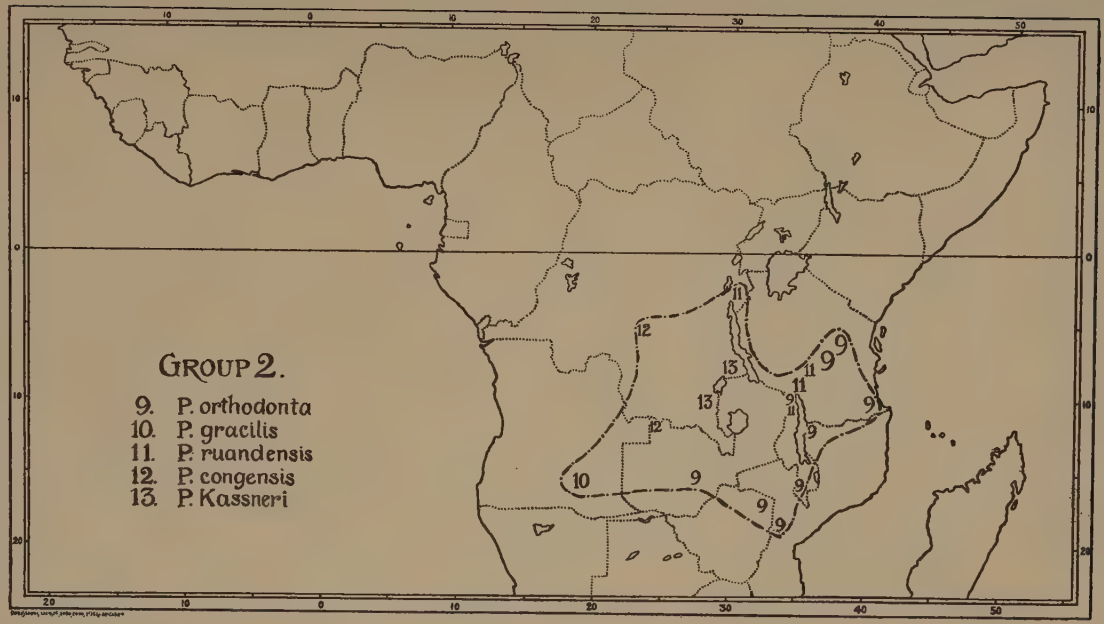
Leaves sessile, not narrowly cuneate at the base, lanceolate, 2–4 cm. long, 0·4–1 cm. broad, subentire or shallowly toothed, sparsely puberulous above and on the nerves below, not conspicuously reticulate ; spikes in fruit 1–2 cm. long and about 1 cm. broad ; calyx-teeth glabrous or shortly pubescent subequal to the tube ; tube pilose in the throat.....**10. gracilis**

Leaves lanceolate or linear-lanceolate, 5–12 cm. long, 0·6–3 cm. broad, toothed, venation reticulate below ; calyx teeth comparatively stout, ± winged near the base, 1·5–3 mm. long in fruit ; tube glabrous in the throat.....**coerulea**

Calyx-teeth in fruit about 5 mm. long, glabrous ; tube glandular and generally pilose outside, leaves linear-lanceolate not conspicuously toothed, 4-8 cm. long and 0·5 cm. broad, narrowly cuneate or attenuate at the base ; spikes 2·5 cm. long and about 1 cm. broad..... **De Wildemaniana**

Calyx in fruit, generally contracted and ± hooded at the throat, if not hooded, fruiting-spikes always over 1·5 cm. broad or calyx-teeth ciliate ; leaves generally broader than above, oblong-lanceolate, lanceolate or ovate-lanceolate, shallowly crenate or dentate, 2·5–12 cm. long, 0·5–3 cm. broad :

Leaves narrowly long-cuneate to the base and sometimes shortly petiolate, lanceolate to ovate-lanceolate, 2·5–6 cm. long, 0·5–2·5 cm. broad, acute or subacute ; bracts broadly lanceolate, or narrowly elliptic, broadest about the middle and narrowed to the base and apex, ciliate ; spikes 2–3·5 cm. long in fruit ; calyx contracted at the throat and hooded, teeth slightly curved, 2–3 mm. long in fruit .....**11. ruandensis**


GROUP 2.
9. P. orthodonta
10. P. gracilis
11. P. ruandensis
12. P. congensis
13. P. Kassneri

Leaves not long-cuneate at the base, subsessile, oblong-lanceolate, lanceolate or ovate-lanceolate, 4–12 cm. long, 0·8–3 cm. broad, acuminate, generally deflexed ; bracts linear, densely pilose-ciliate, 5–8 mm. long ; spikes 3–9 cm. long and 1·5–2·5 cm. broad in fruit ; calyx-teeth sparsely pilose-ciliate, 4–10 mm. long in fruit..... **deflexifolia**

Flowers larger, 0·8–1·5 cm. long, lower lip of corolla deeply boat-shaped :

Calyx-teeth very short, in flower about 1 mm. long, subequal to the tube ; corolla about 1·5 cm. long with a narrow cylindric tube about 6 mm. long and 1 mm. diameter ; spikes short up to 2 cm. long ; leaves lanceolate or linear-lanceolate, 3–8 cm. long, 0·4–2 cm. broad, densely glandular and pubescent on the nerves below.....**12. congensis**

Calyx-teeth much longer than above, 3–8 mm. in flower and up to 10 mm. in fruit ; spikes generally longer :

Leaves generally 3–6 mm., at most 8 mm. broad, and 5–11 cm. long, linear-lanceolate, subscabrid on the nerves below ; in fruit calyx-tube sparsely pubescent and glandular, teeth about 5 mm. long, sparsely ciliate ; flowers 0·8–1 cm. long ; indumentum of stem sparse, scabrid or subscabrid.....**Schweinfurthii**

Leaves 0·8–3 cm. broad, 4–16 cm. long, elongate-lanceolate, linear-lanceolate, lanceolate, oblong-lanceolate or ovate-lanceolate ; indumentum not scabrid, generally appressed :

Flowers about 8 mm. long ; leaves oblong-lanceolate, lanceolate or ovate-lanceolate, 4–12 cm. long, 0·8–3 cm. broad, acuminate ; spikes 3–8 cm. long and 1·5–2·5 cm. broad in fruit ; bracts conspicuous, linear, densely pilose-ciliate.....**deflexifolia**

Flowers larger than above, 1–1·5 cm. long :

Spikes in flower slender and comparatively short, 2–3 cm. long ; bracts inconspicuous ; calyx-teeth in flower 4–6 mm. long, glabrous or sparsely pubescent at the base not pilose ; leaves lanceolate or linear-lanceolate very flaccid 4–8 cm. long, 0·8–2 cm. broad.....**13. Kassneri**

Spikes solitary, in flower broader and longer than above, 3–7 cm. long, in fruit stout, 4–12 cm. long, 2–3 cm. broad ; bracts conspicuous, linear-lanceolate, densely ciliate ; calyx-teeth in flower about 0·6 cm., in fruit 1 cm. long, pilose below, glabrous above ; flowers about 1·5 cm. long ; leaves large, elongate-lanceolate, 10–16 cm. long, 1–2·5 cm. broad..... **speciosa**

Some species have been included in this key which are probably not annuals and do not belong to this Group (*P. Batesii*, *P. Schwein-*

furthii, *P. deflexifolia*, *P. coerulea*, *P. speciosa*), but with the imperfect material and lack of good collectors notes it is often impossible to be certain of this character. These doubtful species have also been included among the perennial herbs in Groups 3 and 6, where they most probably belong.

This group is characterized by the annual habit and the thin, flaccid leaves.

Group 3.

Flowers small, 4–7 mm. long, lower lip of corolla short and shallow about 2 mm. long ; stem neither sulcate nor woody ; leaves neither firm nor leathery :

Calyx not at all hooded in fruit, teeth glabrescent or puberulous, never pilose, stout, winged near the base, 2–3 mm. long ; spikes in fruit about 1 cm., in flower 0·5 cm. diameter ; bracts oblong-lanceolate, about 3 mm. long, very shortly ciliate ; leaves linear-lanceolate to lanceolate, up to 3 cm. though rarely more than 1·5 cm. broad, reticulate below..... **14. coerulea**

Calyx generally hooded in fruit, if not fruiting spikes over 1·5 cm. broad or calyx-teeth long-ciliate :

Leaves long-cuneate to the base and sometimes shortly petiolate, lanceolate to ovate-lanceolate, 2·5–6 cm. long, 0·5–2·5 cm. broad ; bracts ± lanceolate, broadest at the middle and narrowed to the apex and base, ciliate ; spikes 2–3·5 cm. long in fruit ; calyx contracted at the throat and hooded, teeth slightly curved 2–3 mm. long in fruit..... **ruandensis**

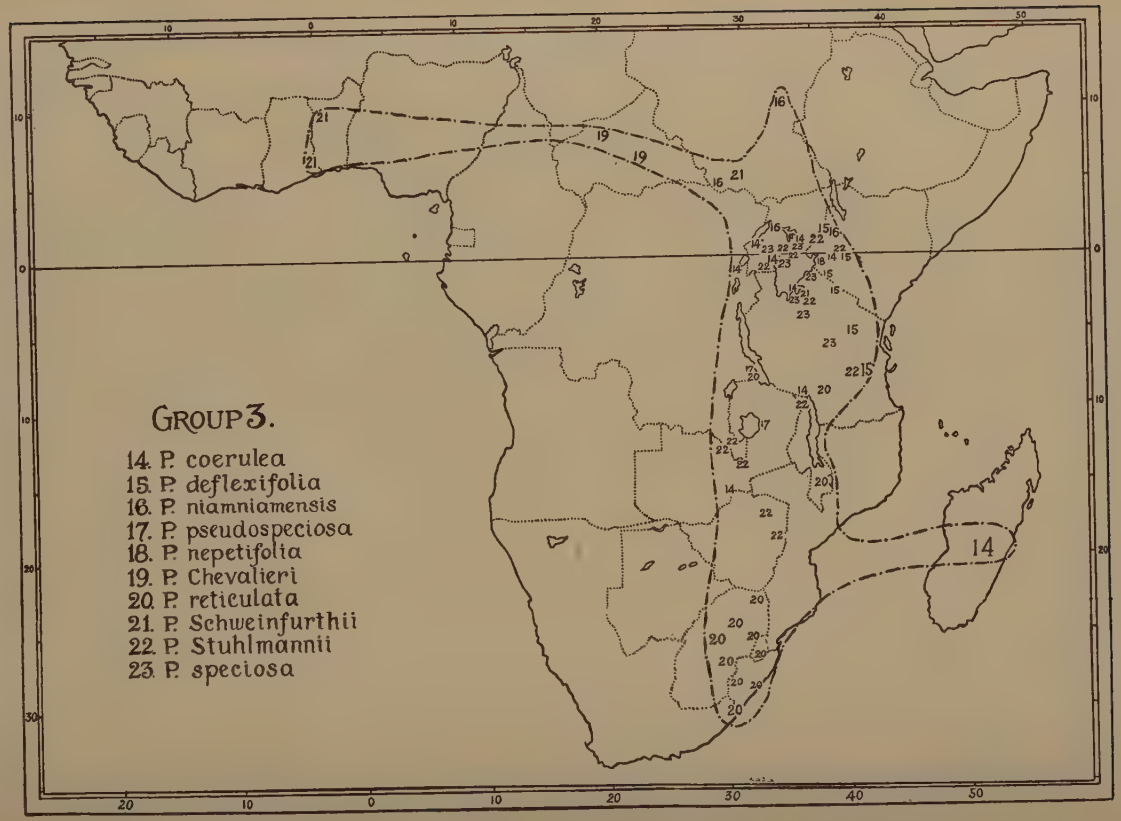
Leaves not long-cuneate at the base, subsessile, oblong-lanceolate, lanceolate or ovate-lanceolate, dentate, 4–12 cm. long, 0·8–3 cm. broad, acuminate, often deflexed ; bracts linear, densely pilose-ciliate, about 5 mm. long ; spikes 3–8 cm. long and 1·5–2·5 cm. broad in fruit ; calyx-teeth sparsely ciliate, 4–10 mm. long in fruit..... **15. deflexifolia**

Flowers larger than above, 0·8–1·8 cm. long ; leaves generally (except *P. Schweinfurthii*, *P. speciosa*) firm, sometimes ± leathery ; stems often sulcate or ± woody :

Leaves rounded to subacute at the apex, never acuminate :

Bracts 1–2 mm. broad, widest about or just below the middle, tapered below and acuminate above, ± papery, chestnut or pale brown ; calyx teeth glabrous to pubescent ; leaves oblanceolate, lanceolate, elliptic, ovate or obovate, very shortly and closely appressed pubescent on the nerves below or glabrous, 4–9 cm. long, 1·5–4 cm. broad ; stem sulcate, appressed pubescent and ± woody..... **16. niamniamensis**

Bracts at most 1 mm. broad, gradually tapered from the base, broadly linear or very narrowly wedge-shaped, ± firm and leathery, dark purple brown ; calyx-teeth pubescent or pilose, never glabrous ; leaves generally oblong-


GROUP 3.
14. P. coerulea
15. P. deflexifolia
16. P. niamniamensis
17. P. pseudospeciosa
18. P. nepetifolia
19. P. Chevalieri
20. P. reticulata
21. P. Schweinfurthii
22. P. Stuhlmannii
23. P. speciosa

lanceolate up to 1·5 cm. broad, if ovate or elliptic not more than 2·5 cm. broad and crisped or spreading pubescent on the nerves below, not appressed ; stem very rarely sulcate .....**20. reticulata**

Leaves acute or acuminate at the apex :

Calyx throat and base of teeth conspicuously long tomentose, teeth short, 2–3 mm. long in young fruit ; leaves shortly petiolate ; bracts inconspicuous.....**Eminii**

Calyx throat and base of teeth not conspicuously long tomentose ; leaves sessile or subsessile :

Leaves ovate, ovate-lanceolate, lanceolate or elliptic, 3–9 cm. long, 1–3 cm. broad sometimes whorled ; stems conspicuously sulcate :

Corolla-lips densely tomentose ; leaves glabrous or shortly pubescent on the nerves below, some at any rate amplexicaul ; bracts linear-lanceolate, caudate-acuminate, conspicuous in flowering stage..... **17. pseudospeciosa**

Corolla thinly pubescent ; leaves not or scarcely amplexicaul ; bracts linear-lanceolate not caudate :

Leaves sparingly pubescent on the nerves below, generally rounded at the base ovate or elliptic ; spikes several.....**18. nepetifolia**

Leaves glabrous below, narrowed to the base, generally arranged in whorls of threes, lanceolate or ovate-lanceolate ; spikes solitary.....**19. Chevalieri**

Leaves linear-lanceolate, oblanceolate, elongate-lanceolate, or occasionally lanceolate, 4–15 cm. long ; stems quadrangular, rounded or rarely sulcate :

Lateral nerves arising at a wide angle to the midrib (60°–90°), then sharply ascending just within the margin ; lamina elongate-lanceolate, linear-lanceolate or occasionally lanceolate, 4–15 cm. long, 0·5–2·5 cm. broad ; spikes short, many, terminal on lateral branches, about 1–3 cm. long in flower and fruit..... **22. Stuhlmannii**

Lateral nerves arising at a narrow angle to the midrib (20°–30°), not abruptly bent :

Spikes large, solitary, terminal, 3–7 cm. long in flower, 4–13 cm. long and about 3 cm. broad in fruit ; leaves large, elongate-lanceolate, 9–20 cm. long, 1·5–3 cm. broad.....**23. speciosa**

Spikes generally many, terminal on lateral branches, narrower than above, 1–2 cm. broad in fruit :

Leaves thin not firm, linear-lanceolate, 5–11 cm. long, 3–6 mm. broad never whorled ; stem never sulcate, pubescence subscabrid..... **21. Schweinfurthii**

Leaves firm not thin, linear-lanceolate, oblong-lanceolate or oblanceolate, 4–12 cm. long, 0·5–1·5 cm. broad, sometimes whorled; stem often sulcate, pubescence soft not subscabrid..... **20. reticulata**

Species included in this key have also been mentioned in the key to Group 2: this is to facilitate the keying-out of species which have some characters in common with both groups.

Group 4.

Calyx-teeth short, 2–2·5 mm. long in flower and young fruit, narrowly but conspicuously winged, glabrous or thinly glandular; calyx-tube not pilose; bracts ovate-lanceolate, attenuate at the base, about 3 mm. long, inconspicuous..... **24. sphaerocephala**

Calyx teeth generally 4–8 mm. long, not or very slightly winged at the base, if less than 4 mm., then not winged:

Calyx-tube and between the teeth pilose; teeth about 2·5 mm. long in flower and up to 5 mm. long in fruit; bracts broadly lanceolate, attenuate at the base, about 2 mm. broad and 4–7 mm. long; stem densely tomentose below the inflorescence; leaves at first pubescent over the lower surface, becoming pubescent on the nerves only..... **25. angolensis**

Calyx-tube and between the teeth not pilose; stem rarely densely pilose below the inflorescence, generally at most pubescent:

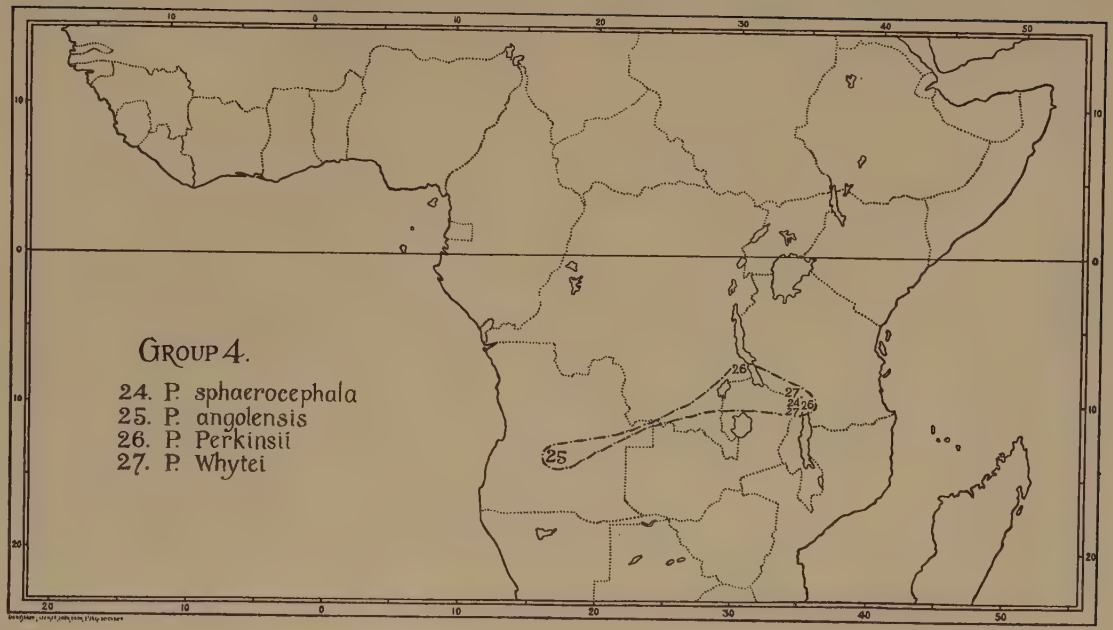
Calyx-teeth slightly winged at the base, glabrous or with a few hairs towards the base, 4–7 mm. long; bracts linear-lanceolate, long-cuneate at the base, 7–12 mm. long, conspicuous..... **26. Perkinsii**

Calyx-teeth not at all winged, 8 mm. long in flower and about 10 mm. in fruit, densely glandular-puberulous; spikes in flower 3·5–4 cm. in fruit 2·5–3 cm. in diameter; bracts linear-lanceolate, about 8 mm. long, inconspicuous..... **27. Whytei**

The species in this group are very closely related to one another, the main difference being in the size and form of the calyx-teeth and in the pubescence of the tube. It is possible that when more material is available these differences may be connected together and that some of the species will then be relegated to synonymy.

Group 5.

Flowers large, 1–2 cm. long, stamens conspicuously exserted; upper lip of corolla short, deeply bifid, about 1 mm. long, throat about 4 mm. diameter; calyx-teeth and tube glabrous or pilose, 0·7–1 cm. long in fruit; bracts lanceolate to linear-lanceolate, about 5 mm. long, acute not caudate, ciliate, minutely pubescent or glabrous; leaves large, 7–24 cm. long, 3·5–12 cm. broad, crenate-dentate..... **28. Elliotii**


GROUP 4.
24. P. sphaerocephala
25. P. angolensis
26. P. Perkinsii
27. P. Whytei
25
26
27
24
26
27

There is a fairly wide range of variation in the indumentum of the calyx-teeth and bracts, but as this is not a constant character it cannot be satisfactorily used for specific or even varietal separation. The material has therefore been treated as a single species.

Group 6.

Leaves very coarsely crenate (5–7 teeth on each side), thin, glabrescent, ovate or broadly ovate, rounded or truncate at the base, acute or acuminate at the apex, 5–7 cm. long, 3–5 cm. broad, long petiolate ; in fruit, spikes short and broad, 3 cm. long and 2·5 cm. broad, calyx-tube conspicuously inflated ; corolla glabrous, 1 cm. long or over.....**29. Batesii**

Leaves not coarsely crenate, if crenate then more than 7 teeth on each side ; calyx-tube not conspicuously inflated in fruit :

Inflorescence relatively lax, usually branched and with visible spaces between the bases of the flowers, 7–20 cm. long, not forming a dense spike ; corolla large, 1·2–2·5 cm. long with a narrow tube and large lower lip ; calyx-tube in fruit asymmetrically expanded below, teeth glandular, tube pilose in the throat ; leaves ovate, crenate-dentate, petiole 2–5 cm. long, lamina 6–15 cm. long, 3–8 cm. broad ; stem succulent or slightly woody.....**30. umbrosa**

Inflorescence compact, forming a dense and almost solid spike ; calyx-tube symmetrical in fruit :

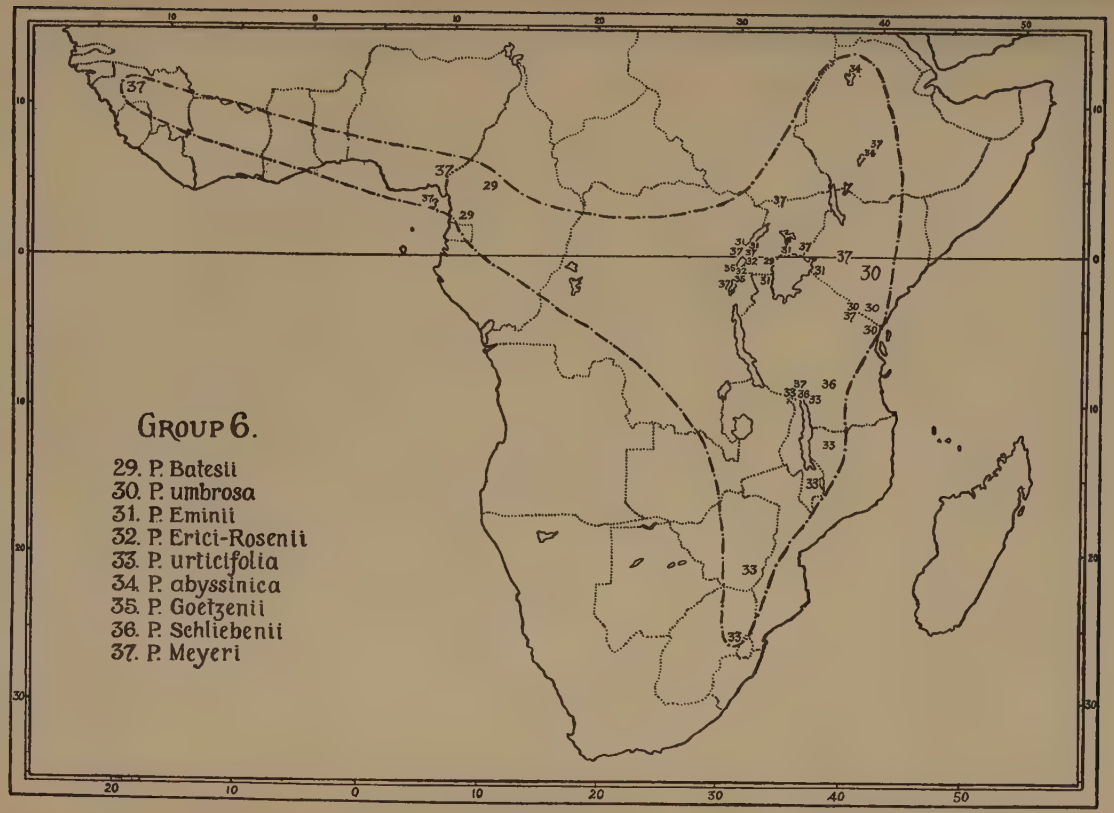
Calyx conspicuously long-matted-tomentose at the throat and at the base of and between the 2–3 mm. long teeth so that the spikes in young fruit appear tomentose with glabrous teeth sticking out ; corolla 0·8–1·3 cm. long, thinly pubescent on the lips, or glabrous ; leaves ovate, 4–11 cm. long and 2–5·5 cm. broad, pubescent below, shortly petiolate ; bracts inconspicuous.....**31. Eminii**

Calyx not very conspicuously long-tomentose at the throat :

Calyx-teeth comparatively short and thick, spreading and slightly curved, 2–3 mm. long in fruit, very shortly pubescent or puberulous, at least at the base, often glandular ; bracts inconspicuous, about 1 mm. broad ; corolla 1–1·5 cm. long, pubescent on the lips ; spikes several, 2–3 cm. long in flower and up to 4 cm. long and about 1 cm. broad in fruit ; leaves 1–3·5 cm. petiolate, ovate, acuminate, closely crenate ; lamina 5–9 cm. long and 2–4 cm. broad, generally fairly densely pubescent below, at any rate on the nerves ; stem ± woody **32. Erici-Rosenii**

Calyx-teeth generally more than 3 mm. long in fruit and more slender than above ; if less than 3 mm. then bracts conspicuous, more than 1 mm. broad :

Leaves broadly ovate, truncate or very widely cuneate at the base, petiole 1·5–5 cm. long, lamina 4–11 cm. long, 3–6 cm. broad, crenate-dentate, thinly pubescent


GROUP 6.
29. P. Batesii
30. P. umbrosa
31. P. Eminii
32. P. Erici-Rosenii
33. P. urticifolia
34. P. abyssinica
35. P. Goetzenii
36. P. Schliebenii
37. P. Meyeri

below ; bracts lanceolate, 1·5–2·5 mm. broad, rather thin, pubescent and glandular ; flowers large, 1·2–2·3 cm. long ; calyx-teeth puberulous, 5–9 mm. long in flower and up to 1·2 cm. in fruit ; spikes often sessile, 2·5–8 cm. long in flower and up to 10 cm. long and 2–3 cm. broad in fruit.....**33. urticifolia**

Leaves generally narrowed to the base, sometimes auriculate, if truncate or widely cuneate then bracts less than 2 mm. broad :

Calyx-teeth and tube conspicuously glandular-puberulous, teeth about 4 mm. long in flower and up to 10 mm. in fruit ; corolla 1–1·5 cm. long ; leaves ovate, crenate-dentate.....**34. abyssinica**

Calyx-teeth and tube not conspicuously glandular-puberulous :

Leaves closely pubescent or tomentose below ; flowers large, 1·5 cm. or over.....**Perkinsii**

Leaves generally at most thinly pubescent on the nerves below, if tomentose over the lower surface then flowers not more than 1 cm. long :

Flowers over 1 cm. (1·2–1·7 cm.) long ; stems generally ± woody :

Flowering spikes comparatively long, 4–8 cm., tapered not rounded at the apex ; leaves lanceolate to ovate-lanceolate, crenate, 7–12 cm. long, 2–5 cm. broad, glabrous or puberulous on the nerves below, otherwise glabrous ; stem woody.....**35. Goetzenii**

Flowering spikes comparatively short, 1–3 cm., rounded at the apex ; leaves lanceolate to ovate-lanceolate, serrate or crenate-serrate, pubescent on the lower surface at least on the nerves.....**36. Schliebenii**

Flowers 0·5–1 cm. long ; calyx-teeth 4–6 mm. long in flower, up to 8 mm. in fruit, glabrous or ciliate ; bracts conspicuous, linear, ciliate ; leaves lanceolate to ovate, crenate-dentate, 6–14 cm. long, 2·5–6 cm. broad, glabrous or thinly pubescent below ; spikes 2–3 cm. long in flower and up to 6 cm. in fruit...**37. Meyeri**

ENUMERATION

1. Pycnostachys graminifolia *Perk.* in Notizbl. Bot. Gart. Berlin, **8,** 66 (1921).

TANGANYIKA TERRITORY. Kilimatinde, 1300 m., *Prittwitz* 118 (type in Berlin Herb.).

2. P. verticillata Bak. in Kew Bull. 71 (1895), et in Dyer, Fl. Trop. Afr. **5,** 383 (1900) ; Perk. l.c. 69.

Northern Rhodesia. Lake Tanganyika; Fwambo, *Carson* 38 (type in Kew Herb.).

3. P. De Wildemaniana *Robyns* et *Lebrun* in Rev. Zool. et Bot. Afr. **16,** 352 (1928).

Belgian Congo. Munama, *Quarré* 1143 (type in Brussels Herb.).

Tanganyika Territory. Iringa, table top of east ridge, 1770 m. *Lynes* l.h. 250 i.

Northern Rhodesia. Abercorn District; near Wambeshi River, 1500 m., *Burtt* 6374. Mwinilunga District: Matonchi Farm, *Paterson* 5. Mumbwa, *Mrs. Macaulay* 1051.

Southern Rhodesia. Lomagundi; Darwendale, 1350 m., *Eyles* 699.

4. P. linifolia *Gürke* in Engl. Bot. Jahrb. **30,** 397 (1902); Perk. l.c. 69. *P. lavanduloides* Perk. l.c. 68.

Tanganyika Territory. Ubena, 1900 m., *Goetze* 798 (type in Berlin Herb.). Uhehe; Utschungwe Mts., 1600 m., *Hauptmann Prince* 28a.

5. P. Prittwitzii *Perk.* in Notizbl. Bot. Gart. Berlin, **8,** 68 (1921).

Tanganyika Territory. South West Iringa; Ndembera-Niederung, near Gominyi, *Haupt.* v. *Prittwitz* u. *Gaffron* 28 (type in Berlin Herb.).

Northern Rhodesia. 25 miles S. of Abercorn, 1440 m., *Hutchinson* et *Gillett* 4023.

6. P. parvifolia *Bak.* in Kew Bull. 72 (1895), et in Dyer, Fl. Trop. Afr. **5,** 381 (1900); Perk. l.c. 68.

Tanganyika Territory. Between Lake Tanganyika and Lake Rukwa, 1800 m., *Nutt* s.n. Rungwe District; 1500 m., *Davies* 471.

Nyasaland. Tanganyika Plateau, Fort Hill 1050–1200 m., *Whyte* s. n.

Northern Rhodesia. Lake Tanganyika; Fwambo, *Carson* 26, 34, 92, 103 (type in Kew Herb.).

7. P. Descampsii *Briq.* in Bull. Soc. Bot. Belg. **37,** 63 (1898); Bak. in Dyer, Fl. Trop. Afr. **5,** 380 (1900); Perk. l.c. 69.

Belgian Congo. Lufongo River, Kisobi, *Descamps* s.n. (type in Brussels Herb.). Between Pweto and Baudouinville, *Robyns* 2037. Kasanga River, *Kassner* 2660. Kundelunga, *Kassner* 2762, 3618.

8. P. pallide-caerulea *Perk.* in Notizbl. Bot. Gart. Berlin, **8,** 67.

British Cameroons. Bansso Mts.; Kumbo, 1800–2000 m., *Ledermann* 5738 (type in Berlin Herb.).

9. P. orthodonta *Gürke* in Engl. Pflanzw. Ost-Afr. **C.** 345 (1895); Bak. l.c. 386; Perk. l.c. 77. *P. cyanea* Gürke l.c. *P. leptophylla* Bak. in Kew Bull. 161 (1898), et in Dyer, Fl. Trop. Afr. **5,** 386 (1900); Perk. l.c. *P. Hanningtonii* Bak. in Dyer, Fl. Trop. Afr. l.c. 384; Perk. l.c. *P. Bussei* Gürke in Engl. Jahrb. **36,** 131 (1905); Perk. l.c.

Tanganyika Territory. Usagara; Tubugwe, about 900 m., *Stuhlmann* 213. Ugogo, *Hannington* s.n. Kondoa District; Sambala, 1470 m., *Burtt* 2014. Mpwapwa, 1050 m., *Hornby* 248. Lindi District, 500 m., *Busse* 2834.

Portuguese East Africa. Gorongoza District, near Gouveia, *Carvalho* s.n. (type in Berlin Herb.). East Coast of Lake Nyasa, *Johnson* 69. Island of Likoma, *Johnson* 37.

Nyasaland. Between Kondowe and Karonga, 600-1800 m. *Whyte* s.n. Without locality, *Buchanan* 873.

Northern Rhodesia. Namwala, *Gordon Reade* 38, 65.

Southern Rhodesia. Salisbury, *Eyles* 8538.

10. P. gracilis *R. Good* in Journ. Bot. **69,** Suppl. **2,** 164 (1931).

Angola. Benguella; by the Longa River, *Gossweiler* 2982; By the River Cuartiri, *Gossweiler* 4035—both these numbers are cited in the type description but no type number has been selected. (British Museum and Kew Herb.)

11. P. ruandensis *De Wild.* Pl. Bequaert. **4,** 401 (1928). *P. clinodon* Mildbr. in Notizbl. Bot. Gart. Berlin, **11,** 405 (1932).

Belgian Congo. Between Kirinda and Lubengera, 1900 m., *Robyns* 2449 (type in Brussels and Kew Herb.).

Tanganyika Territory. Lupembe, near Iringa, *Schlieben* 1053. North of Lake Nyasa, *Whyte* s.n. Kyimbila District; Bundale Mts., 1600–1800 m., *Stolz* 787, 1281.

Nyasaland. Nyika Mts., 1200–1800 m. *Whyte* s.n.

12. P. congensis *Gürke* in Bull. Herb. Boiss. **4,** 819 (1896); Baker in Dyer, Fl. Trop. Afr. **5,** 380 (1900); Perk. in Notizbl. Bot. Gart. Berlin. **8,** 71 (1921).

Belgian Congo. Samba, *Descamps* 28 (type in Brussels Herb.).

Northern Rhodesia. Mwinilunga District, 1200–1500 m., *Marks* 75.

13. P. Kassneri *De Wild.* in Contrib. Fl. Katanga 172 (July 1921), et in Ann. Soc. Sci. Brux. **41, 2,** 54 (1921) descr. ampl. *P. carigensis* Gürke ex De Wild. Etud. Fl. Katanga **2,** 135 (1913) nomen.

Belgian Congo. West Kundelunga, *Kassner* 2794 (type in Kew Herb.). Between Pweto and Baudouinville, *Robyns* 2045. Mugila Mts., *Kassner* 2967.

14. P. coerulea *Hook.* Exot. Fl. **3,** 202 & fig. (1825); Perk. l.c. 69 in obs. *P. micrantha* Gürke in Engl. Pflanzenw. Ost-Afr. **C.** 345 (1895); Bak. in Dyer, Fl. Trop. Afr. **5,** 381; Perk. l.c. *P. stenostachys* Bak. l.c. 380; Perk. l.c. *P. brevipetiolata* De Wild. Pl. Bequaert. **4,** 394 (1928).

Belgian Congo. Kaisafu, Rutshuru River, *Bequaert* 5972.

Uganda. Kibibi; Buruma, *Maitland* 1069. Kigezi District; edge of Lake Chaliati, 1860 m., *Gilbert Rogers* 354. Kinabu Gap, 2350 m., *Chandler* 2656. Butale, near Kabale, 1800 m., *Synge* 1199, 1219. Toro; Kitakwenda, 1200 m., *Bagshawe* 1248, 1249. N.W.

01 Lake Bunyoni, *Taylor* 2147. Entebbe, 1170 m., *Brown* 224, 336; 1140 m., *Maitland* 623. Nubi village, 1110 m., *Godman* 28. Unyoro District; sides of the Nile, *Speke et Grant* s.n. Kampala; Fort Portal, 2100 m., *Tothill* 232. Lake Nabugabo; Masaka, 1200 m., *Synge* 1945.

Kenya Colony. Naivasha, 1800 m., *Napier* 1839; 1870 m., *Mearns* 700; 1920 m., *Chandler* 2375.

Tanganyika Territory. Bukoba, *Stuhlmann* 3718. Speke Gulf, near Mwanza, 1110 m., *Burtt* 2469. Kyimbila, 550 m., *Stolz* 757, 758.

Northern Rhodesia. Mazabuka, *Trapnell* 485.

Madagascar. Cult. *Mr. Barclay*, Bury Hill, seeds from plant in Herb. Hook., coll. Bojer et Helsinger (type in Kew Herb.). Emirna Province; Ramssina, *Bojer* et *Helsinger* s.n. Without locality, *Lyall* 329. Ampotaka, near Tananarivo, *Hildebrandt* 3482. Without locality, *Blackburn* s.n.; *Baron* 381, 935, 3310, 4937, s.n. Between Homobutha and Ombohinibombo, *Forsyth Major* 716. Near Ankeramadinika, *Scott Elliot* 1765. Near Angalampena, *Scott Elliot* 2115.

Most of the specimens from Madagascar have rather longer calyx-teeth than those from Tropical Africa, but this is not an invariable rule as a specimen from Kenya (*Napier* 1839) has teeth equal in length to *Hildebrandt* 3482 from Madagascar. This character is therefore not constant and cannot be used for specific separation. In other respects, the specimens from Africa are similar to those from Madagascar so it has not been possible to keep up *P. micrantha* as a distinct species.

15. P. deflexifolia *Bak.* in Dyer, Fl. Trop. Afr. **5**, 381 (1900); *P. reticulata* Benth. sec. Perk. l.c. 71 non Benth. quoad *Scott Elliot* 6756. *P. speciosa* Gürke in Engl. Pflanzenw. Ost-Afr. **C.** 345 (1895) quoad *Fischer* 510; Bak. l.c. 382.

Uganda. Mt. Debasien, 1800 m., *Eggeling* 2658.

Kenya Colony. Elmenteita, over 1800 m., *Scott Elliot* 6756 (type in Kew Herb.). Njoro road, 2100 m., *Napier* 468. Visoi, 1950 m., *Napier* 2544. Kipkarren, Turbo and Soy, *Broadhurst Hill* 434. Mt. Elgon, 2100 m., *Chaytor-Jack* 189. 1950–2250 m., *Lugard* 134. 2010 m., *Taylor* 3850. Without locality, *Tweedie* 239.

Tanganyika Territory. Massai, *Fischer* 510. Kikori, *Burtt* 2695. Kondoa District; Sambala, 1470 m., *Burtt* 2055, 2128. Mpwapwa, 1200–1500 m., *Burtt* 3859. Iringa, *Emson* 581.

The specimens from Tanganyika differ from the Uganda and Kenya material in having slightly larger flowers and longer calyx-teeth. It was at one time thought that this might constitute a new species, *P. intermedia*, but considering the variation which occurs within other species it has been decided to include the material under *P. deflexifolia*. This species comes very close to *P. speciosa* from which it is distinguished by the smaller flowers.

16. P. niamniamensis *Gürke* in Engl. Jahrb. **22,** 145 (1895) ; Bak. l.c. 383 ; Perk. l.c. 71. *P. Pethereckii* Bak. l.c. 383 ; Perk. l.c. *P. decussata* Bak. l.c. 382. *P. reticulata* Benth. sec. Bak. l.c. 382, pro parte non Benth. quoad Speke & Grant. s.n. *P. Lindblomii* Th. C. E. Fries in Notizbl. Bot. Gart. Berlin, **11,** 24 (1930).

Anglo-Egyptian Sudan. Niamniam ; east of River Huuh, *Schweinfurth* 3750 a (type in Berlin Herb.). White Nile, *Petherick* s.n.

Uganda. Unyoro ; Ukidi forest, *Speke* et *Grant* s.n. Near Kafu River, 900 m. *Bagshawe* **955.**

Kenya Colony. Mt. Elgon ; Kitosh, *Lindblom* s.n. Kavirondo, *Scott Elliot* 7155. 1st and 2nd days march from Munias, *Whyte* s.n. North Nandi, 1950 m., *Dale,* 3411. Lolgerien, 1620 m., *Napier* 5406.

17. P. pseudospeciosa *Busc.* et *Musch.* in Engl. Jahrb. **49,** 486 (1913). *P. mausaensis** Gürke ex De Wild. Etude Fl. Katanga **2,** 135 (1913) nomen, et Notes Fl. Katanga **7,** 47 (1921) descr. *P. ballotoides* Perk. in Notizbl. Bot. Gart. Berlin **8,** 72 (1921).

Belgian Congo. Mt. Senga, *Kassner* 2920 a, 2930 a.

Northern Rhodesia. Lake Bangweulu, 1300 m., *Elena D'Aosta* 1002 (type in Berlin Herb.).

18. P. nepetifolia *Bak.* in Dyer Fl. Trop. Afr. **5,** 383 (1900) ; Perk. l.c. 72.

Kenya Colony. Kavirondo District ; Nandi Range, 2100–2400 m., *Scott Elliot* 6471 (type in British Museum & Herb. Kew).

19. P. Chevalieri *Briq.* in Bull. Soc. Bot. France 1911, 58, Mem. **8,** 193 (1912).

Oubangi-Chari. Dar Banda, Kaga Dje to Kaga Pongourou, *Chevalier* 6565 (type in Chevalier & Kew Herb.). Kaga Dje to Bamingui, *Chevalier* s.n.

20. P. reticulata (*E. Mey.*) *Benth.* in DC. Prod. **12,** 83 (1848) ; Perk. l.c. 71 pro. parte. *P. Kirkii* Bak. l.c. 381. *P. purpurascens* Briq. in Bull. Herb. Boiss. **2, 3,** 998 (1903). *P. Schlecteri* Briq. l.c. 999. *P. holophylla* Briq. l.c. 1000. *P. uliginosa* Gürke in Engl. Bot. Jahrb. **30,** 396 (1901). *P. reticulata* (E. Mey.) Benth. var. *B. angustifolia* Benth. l.c. *Echinostachys reticulata* E. Mey. in Comm. Pl. Afr. Austr. 243 (1837).

Tanganyika Territory. Ubena, 1900 m. *Goetze* 806. Lupembe ; upper Ruhudje, *Schleiben* 666.

Nyasaland. Manganja Hills, 900–1200 m., *Kirk* s.n. Unagu to Lake Shiré, 900–1350 m., *Johnson* 36. Without locality, *Buchanan* 70, 700.

Transvaal. Macalisberg, *Burke* 111. Witwatersrand, *Hutton* 878. Barbeton District : White River, 990 m., *Rogers* 2294. Umlomati valley, *Galpin* 1318 ; *Thorncroft* 4344. Lydenburg District ; Spitzkop Goldmine, *Wilms* 1122 ; 1122 b. Pilgrims Rest,

* This has been variously spelt : *mansaensis, mausaensis* and *nausaensis.*

Rogers 14521 ; *Roe* 2647. Pretoria District ; Wilge River, *Pole Evans* 3539. Aapies Poort, *Rehmann* 4111. Rayton, *Rogers* 20471. Aapies River. *Leendertz* 1108. Johannesburg District ; Rooikop Farm, *Gilfillan* 7142 ; *Laidley* 347. Witpoortze Kloof, *Moss* 4769. Roodepoort, *Rand* 1238, 1291 ; Nylstrom, *Repton* 547. Belfast District ; Schoemanskloof, *Smuts* 53A. Zoutpansberg, *Schweickerdt* et *Verdoorn* 518. Portgietersrust, *Galpin* 9068. Marovougpe, *Junod* 1607. Houtbosh ; Woodbush Mts., *Nelson* 438 ; *Rehmann* 6174.

Swaziland. Hlatikulu, *Stewart* 99.

Orange Free State. Without locality, *Cooper* 1070.

Natal. Near Durban, *Drege* s.n. (type in Kew Herb.) ; *Krauss* 329 ; *Medley Wood* 1016. Without locality *Gerrard* 101. Indiana, 440 m., *Medley Wood* 59. Highland Station, 1600 m., *Kuntze* s.n. Alexandra District ; Dumisa, 600 m., *Rudatis* 369. Estcourt, *Galpin* 11752. Mount aux Source, *McClean* et *Bayer* 233. Oribi Flats, *McClean* 391. Mt. Elomdspruit, *Schlecter* 3884. Ispingo, *Schlecter* 2802.

Cape Division. East Griqualand ; Clydesdale, 900 m., *Tyson* 859, 2753. Mt. Frere, *Schlecter* 6406. Kentani, *Pegler* 417. Pondoland, *Bachmann* 1181.

P. reticulata is a very variable species and it is difficult to decide on its limits as the different forms grade into one another. The South African material shows the following variation in leaf form : the narrowly lanceolate acuminate type (*Leendertz* 1108 and *Galpin* 9068), the rather broader form with very conspicuous toothing (*Schweickerdt & Verdoorn* 518), the type with broadly lanceolate, subacute leaves and inconspicuous teeth (*Rehmann* 6174) and lastly the broad blunt form with conspicuous teeth (*Krauss* 329). Between these different extremes there are a number of intermediate forms, so that although the specimens at opposite ends of the range look very different they can be connected by intervening links.

The characters of the inflorescence can be dealt with in the same way. In most cases there are several spikes on lateral branches but single ones can be found (*Galpin* 1318 & *Rehmann* 4111) ; the calyx-teeth are normally pubescent to the apex with rather short hairs but sometimes they are glabrous at the apex and have longer hairs below (*Junod* 1607, *Nelson* 438 & *Rehmann* 6174), so that although considerable variation occurs within the species, it is not constant and therefore not of specific value.

The Tropical African material when compared with the bulk of material from South Africa shows the following variation : shorter, comparatively broader, less acuminate, inconspicuously toothed leaves ; longer hairs on the calyx teeth which tend to be glabrous at the apex and rather stiffer less acuminate bracts. Specimens can, however, be picked out from the South African material which conform to those from Tropical Africa in one or other of these points, so that no satisfactory separating characters can

be found. The material is therefore considered to be one species, within which there is great variability. *P. uliginosa* is included as an extreme broad-leaved form.

21. P. Schweinfurthii *Briq.* in Engl. Bot. Jahrb. **19,** 191 (1894) ; Bak. l.c. 380 ; Perk. l.c. 70. *P. togoensis* Perk. l.c. 69 ; Hutch. & Dalz. Fl. West Trop. Afr. **2,** 288 (1931).

Gold Coast. Ashanti ; Dubwesein, *Chipp* 621. Afram plains, *Irvine* 890.

Togoland. Between Kete and Volta, *Baumann* 404. Krakye, *Krause* s.n.

Anglo-Egyptian Sudan. Bongoland ; Dukuttu, *Schweinfurth* 2770 (type in Kew Herb.)

Tanganyika Territory. Ngudu District, Maliaraguru, 1170 m., *Burtt* 5110.

P. togoensis was separated from *P. Schweinfurthii* on its sessile, not shortly petiolate leaves. This difference does not appear to be very sharply defined, as in both cases the lamina is narrowed to the base and it is difficult to tell where the lamina ends and the " short petiole " commences. There are leaves on *Chipp* 621, which might be termed subsessile, and are equivalent to some of those on the type of *P. Schweinfurthii*. As this distinction is unsatisfactory *P. togoensis* has been reduced to synonymy.

22. P. Stuhlmannii *Gürke* in Engl. Pflanzenw. Ost-Afr. **C.** 345 (1895) ; Bak. l.c. 380 ; Perk. l.c. 70 pro parte. *P. remotifolia* Bak. l.c. 381. *P. Bequaertii* De Wild. Contrib. Fl Katanga, 171 (1921). *P. longifolia* De Wild. l.c. 172.

Belgian Congo. Dembo-Shinsenda, *Bequaert* 425. Welgelegen-Dembo, *Bequaert* 562. Elizabethville, 1440 m., *Rogers* 10922.

Uganda. Ngaramo, West of Lake Victoria, *Stuhlmann* 1630 (type in Berlin Herb.). Entebbe, *Fyffe* 148. Teso District ; Serere, 1080 m., *Chandler* 78, 854. Kiebbe ; Katera, *Thomas* 1327. Mabira Forest, 1200 m., *Dawe* 167.

Kenya Colony. S. W. slopes of Mt. Elgon, *Tweedie* 117. Mt. Elgon, 1950 m., *Lugard* 19 ; 1950–2100 m., *Chater Jack* 20, 122. Trans-Nzoia District, 1800–2100 m., *Gardner* 3725. Gishu Plateau, *Dowson* 669 ; 2100 m., *Harvey* 110. Between Nandi and Mumias, *Whyte* s.n. Kipkarren, *Brodhurst Hill* 688. Without locality, *Brodhurst Hill* 425.

Tanganyika Territory. North West Uzinza ; West Mwanza, 1200 m., *Burtt* 6575. Iringa District ; Mbosi, 1500 m., *Horsburgh-Porter* s.n.

Nyasaland. Fort Hill, 1050–1200 m., *Whyte* s.n.

Northern Rhodesia. Broken Hill, *Rogers* 8032. Luangwa Escarpment, 1200 m., *Young* s.n. Mufulira, *Eyles* 8275, 8199.

Southern Rhodesia. Near Salisbury, *Craster* s.n. Salisbury, 1500 m., *Eyles* 1613. Umtali Division ; Odanzi River valley, *Teague* 44. Without locality, *Hislop* 55. Miami, *Rand* 73.

This species is very variable in leaf size and pubescence, and in the presence or absence of a short petiole, but as in *P. reticulata* a gradation can be traced, which links up these different forms, so the material has been considered as a single species. The Kenya form tends to have shorter and broader leaves, whereas the material from Rhodesia has narrower, glabrescent leaves and rather larger flowers, approaching *P. Schweinfurthii*, but distinguished from it by the firmer texture of the leaves and by having the lateral nerves arising at a wide angle from the midrib.

23. P. speciosa *Gürke* in Engl. Pflanzenw. Ost-Afr. **C.** 345 (1895) quoad *Fischer* 499; Perk. l.c. 70; Bak. l.c. 382, pro parte. *P. affinis* Gürke in Engl. l.c.; Perk. l.c. 71; Bak. l.c. *P. Dawei* N.E. Br. in Gard. Chron. **41,** 18 (1907); Perk. l.c. 77.

Uganda. Mabira; Chagwe, 1200 m., *Dawe* 153. South Buddu, *Dawe* 331. Budda, 1230 m., *Brown* 138. Tenth March from Mumias, fourth day from Usogo, one day from Lubwas, *Whyte* s.n. Entebbe, *Maitland* 235. Kampala, *Hargreaves* T. 1193. Masaka District; Katera, 1140 m., *Thomas* 1292. Masaka, 1200 m., *Hansford* 2352.

Tanganyika Territory. East shore of Victoria Nyanza, *Fischer* 499 (type in Berlin Herb.). Tabora District; Ugogo-Nyembe, *Braun* 5402. Musoma, *Emson* 333. Kazikazi, 1260 m., *Burtt* 4526. Shinyanga, 1080 m., *Burtt* 2435; *Bax* 363. Muansa, *Stuhlmann* 4693.

Cultivated. Raised from seed received from *Mr. Dawe*, Uganda, in 1905. *Hort. Wallace*, type of Bot. Mag. t. 8450. *Cult. Ganashkind Garden*, Kirkee, Bombay in 1909.

Both *Fischer* 499 and 510 are cited in the type description of *P. speciosa:* the former has been selected as the type as it conforms to the description, " . . . . corollis maximis caeruleis." *Fischer* 510 differs in its much smaller flowers and has been placed in *P. deflexifolia*. This species and *P. speciosa* are very closely related as has already been mentioned in the citation of *P. deflexifolia* (no. 15).

24. P. sphaerocephala *Bak.* in Kew Bull. 162 (1898), et in Dyer Fl. Trop. Afr. **5,** 382; Perk. l.c. quoad *Whyte* 139.

Nyasaland. Nyika Plateau, 1800–2100 m., *Whyte* 139 (type in Kew Herb.)

This is separated from *P. Whytei* by the very much shorter, winged calyx-teeth.

25. P. angolensis *G. Tayl.* in Journ. Bot. **69,** Suppl. **2,** 164 (1931).

Angola. Anha, Casima rivulet, *Gossweiler* 1734 (type in B.M. Herb.). Benguella, between Ganda and Caconda, 1700 m., *Hundt* 934.

26. P. Perkinsii *E. A. Bruce* nom. nov.—*P. Kassneri* Perk., in Notizbl. Bot. Gart. Berlin **8,** 73 (Sept. 1921) non De Wild. Contrib. Fl. Katanga, 172 (July 1921).

Belgian Congo. Mt. Mugila, *Kassner* 2991a (type in Kew and British Museum Herb.)

Nyasaland. Tanganyika Plateau, *Carson* s.n.

27. P. Whytei *Bak.* in Dyer, Fl. Trop. Afr. **5,** 383 (1900). *P. sphaerocephala* Perk. l.c. 73, quoad *Whyte* s.n.

Tanganyika Territory: Iringa Province; Mbosi, 1500 m., *Horsbrugh-Porter* s.n.

Nyasaland. Tanganyika Plateau; Fort Hill, 1050-1200 m., *Whyte* s.n. (type in Kew Herb.).

28. P. Elliotii *S. Moore* in Journ. Linn. Soc. Bot. **38,** 275 (1908). *P. urticifolia* Hook. sec. Bak. l.c. 387 pro parte non Hook. *P. Volkensii* Gürke sec. Perk. l.c. 75 pro parte non Gürke. *P. butaguensis* De Wild. Pl. Bequaert. **4,** 389 (1928). *P. Bequaertii* De Wild. l.c. 393 non De Wild. Contrib. Fl. Katanga 171 (1921). *P. cinerascens* Robyns et Lebrun nom. nov. in Rev. Zool. et Bot. Afr. **16,** 352 (1928).

Belgian Congo. Ruwenzori; Butagu, c. 3000 m., *Bequaert* 3715. Lamia, c. 2500 m., *Bequaert* 4287. Semiliki River, *Kassner* 2085 vel 3085. Ruwenzori slopes, *Kassner* 3115.

Uganda. Ruwenzori, *Scott Elliot* 7719. Bikomi, *Taylor* 2718, 2865. Nyinabitaba, 2510 m., *Eggeling* 1356; 2400 m., *V.E.H.* H. 1; 2550 m., *Fishlock* et *Hancock* 26. Toro, *Fyffe* 15. Bwamba Pass, 2400 m., *Hazel* 164. Nyamgasani Valley, 2400 m., *Synge* 1477; 2700 m., *Wollaston* s.n. (type in British Museum Herb.); *Longfield* 58; 2100 m., *Humphreys* s.n. Nakitawa, 2400–2700 m., *Godman* 363.

P. Mildbraedii Perk. in Wiss. Ergebn. Deutsch. Zentr. Afr. Exped. 1907–8, **2,** pt. 1, 548 (1913) is most probably synonymous with *P. Elliotii* S. Moore. The type of the former species, *Aldolf Friedrich* 2537, from the Butagu valley, Ruwenzori has not been traced in Berlin, where it was requested on loan. Miss Perkins does not cite the species or the type number in her revision of the Tropical African species of Pycnostachys in Notizbl. Bot. Gart. Berlin 8, 63 (1921), but at the end of the original description of *P. Mildbraedii* she states that *Kassner* 3085 belongs to that species. This number, however, is cited above under *P. Elliotii*, so that unless Miss Perkins has misidentified *Kassner* 3085, *P. Mildbraedii* Perk. is synonymous with *P. Elliotii* S. Moore.

29. P. Batesii *Bak.* in Dyer, Fl. Trop. Afr. **5,** 386 (1900); Perk. l.c. 76.

Cameroons. Efulen, *Bates* 372 (type in Kew Herb.) Between Jaunde and Dengdeng, *Mildbraed* 8449.

Uganda. Budongo Forest, *Eggeling* 1429.

30. P. umbrosa (Vatke) *Perk.* in Notizbl. Bot. Gart. Berlin, **8,** 77 (1921). *Coleus umbrosus* Vatke in Linnaea 43, 91 (1880–1882); Bak. l.c. 434.

Kenya Colony. Ukamba District; Kitui, *Hildebrandt* 2743. Taita District; N'dara, *Hildebrandt* 2424 (type in Berlin Herb.). Mwatate, 600 m., *Johnston* s.n.; *Napier* 945. Taita Hills; Wusi, 1350 m., *Napier* 1077. Kibwesi District; 1000 m., *Scheffler* 65; 160, 462; 900 m., *Dummer* 5108. Makindu River, *Kassner* 566. Nairobi Arboretum, *Gardner* 1399.

Tanganyika Territory. Kilimanjaro; Kwa Ngowe, *Volkens* 357. Usambara District; Kwa Mshuza, 1570 m., *Holst* 9159. Magoma-Kalange, *Braun* 2716. Muafu, *Buchwald* 621. Western Usambaras, above 900 m., *Swynnerton* 4. Makuyuni District, 400–1000 m., *Kortischoner* 789, 912. Kilimanjaro; Useri, 1350 m., *Haarer* 1740. Loitokitok, 1800 m., *Schlieben* 5121.

31. P. Eminii *Gürke* in Engl. Bot. Jahrb. **22,** 145 (1895); Bak. l.c. 385; Perk. l.c. 72. *P. ruwenzoriensis* Bak. l.c. 384. *P. rotundata-dentata* De Wild. Pl. Bequaert. **4,** 391 (1928).

Belgian Congo. At the foot of Ruwenzori, Kisuki, 1300–1400 m., *Bequaert* 4701.

Uganda. Ruwenzori, 1500 m., *Scott Elliott* 7621. North Ruwenzori; Mahyoro, 2400 m., *Makere College* 146/36. Entebbe, 1150 m., *Maitland* 533. 4 miles from Entebbe Road, 1200 m., *Laboratory Staff* 2350. Near Kampala, 1200 m., *Dummer* 3210. Toro; Bunganyalo, 1500–1800 m., *Snowden* 660. Fort Portal, *Taylor* 2586. Ibonde Pass; Bwamba, 2550 m., *Thomas* 770. Hunga, *Bagshawe* 382.

Kenya Colony. Kisii, 1620 m., *Napier* 5405.

Tanganyika Territory. Bukoba; Katoki, *Braun* 5569. Kanesse, west of Lake Victoria, *Stuhlmann* 943 (type in Berlin Herb.).

32. P. Erici-Rosenii *R. E. Fries*, Wiss. Ergebn. Schwed. Rhod.-Kongo-Exped. 1911–12, **1,** 281 (1916). *P. Robynsii* De Wild. Pl. Bequaert. **4,** 398 (1928). *P. albidoviolacea* De Wild. l.c. 400.

Belgian Congo. Ninagongo, c. 2000 m., *Fries* 1588 (type in Uppsala Herb.). Boswenda, *Bequaert* 6087. Near Busiga, 1900 m., *Robyns* 2356.

Uganda. Kigezi; *Sanford* T. 1213. Kinabu Gap, 2350 m., *Chandler* 2657. Nakalembe, 2220 m., *Gilbert Rogers* 291. North slopes of Mahavura, 2700 m., *Gilbert Rogers* 343b. Behungi, 2400 m., *Thomas* 1071; 1800–2400 m., *Godman* 224.

P. Robynsii has been included under this species, though there are slight differences between it and the type of *P. Erici-Rosenii*. In *Robyns* 2356 (the type of *P. Robynsii*) the leaves are less pubescent and the secondary nerves more conspicuous below, whilst the corollas are rather more pubescent and the calyx-teeth less stout, than in the type of *P. Erici-Rosenii*. These small differences, however, do not seem sufficient to warrant specific separation when the variation within other species of the genus is taken into consideration. *P. Robynsii* is therefore treated as synonymous with *P. Erici-Rosenii*.

33. P. urticifolia *Hook.* in Bot. Mag. t. 5365 (1863); Bak. l.c. 386 excl. *Scott Elliot* 7719; Perk. l.c. 74. *P. pubescens* Gürke in Engl. Pflanzenw. Ost-Afr. **C,** 345 (1895). *P. urticifolia* Hook. var. *pubescens* Gürke in Engl. Bot. Jahrb. **22,** 146 (1895).

TANGANYIKA TERRITORY. Kyimbila, 1350 m., *Stolz* 837. Mts. East of Lake Nyasa, *Johnson* s.n. Lyamungo Expr. Sta., 1350 m., *Greenway* 4525.

PORTUGUESE EAST AFRICA. Mozambique District, near Gorungosa, *Carvalho* s.n.

NYASALAND. Cult. *Messrs. Backhouse,* seeds sent by Dr. Livingstone from Mt. Zomba, Bot. Mag. t. 5365 (type in Kew Herb.). Zomba, *Clements* 369; *Burtt Davy* 1863. Manganja Hills, 150–900 m., *Meller* s.n. Mbame, 900 m., *Kirk* s.n. Mlanje 900 m., *Gunns* 107. Shiré Highlands; Blantyre, *Buchanan* 152, 207; *Webb* s.n; *Adamson* 64. Mt. Chiradzulu, 1200 m., *Whyte* s.n. Without locality, *Buchanan* 61, 296, 586; 1050 m., *Godman* 182; *Moss* 15092.

SOUTHERN RHODESIA. Zimbabwe, *Pole Evans* 2722. Manica District; Odzani River valley, *Teague* 217. Singesi River, *Myres* 416. Near Chipete Forest, 1140 m., *Swynnerton* 521. Outskirts of Cherinda, 1140 m., *Swynnerton* 334. Cult. *Mr. Ayres,* seeds sent from Bulawayo. Cleveland Dam, East of Salisbury, *Gilliland* 35; *Moss* 16948. Rua River, 1500 m., *Eyles* 1324. Matopo Hills, 1500 m., *Eyles* 54. Victoria, *Monro* 354, 1052. Salisbury, *Rand* 525.

TRANSVAAL. Near Barberton, c. 360 m., *Bolus* 9745; 900 m., *Galpin* 943. Woodbush Mts., *Barber* 4. Without locality, *Saunders* 140.

34. P. abyssinica *Fres.* in Flora **2,** 608 (1838); Bak. l.c. 385; Perk. l.c. 77. *P. longiacuminata* Perk. l.c. 76 pro parte.

ABYSSINIA. near Gonda, *Schimper* 1351. Sidamo; Lake Abassa, *Ellenbeck* 1728a quoad specim. sinistr. *Rüppell* (Type in Senkenberg Herb. Frankfurt). Unfortunately the type, though requested on loan, was not obtainable, so has not been examined.

35. P. Goetzenii *Gürke* in Engl. Pflanzenw. Ost-Afr. **A.** 135 (1895) nomen, et in Goetzen, Durch Afr. v. Ost nach West, Sonderabdr. 8 [1896]; Bak. l.c. 385; Perk. l.c. 74.

UGANDA. Virunga Mts.; Ruanda, 2500 m., *Goetzen* 98 (type in Berlin Herb.). Mgahinga, 2550 m., *Eggeling* 1069; 2400–2700 m., *Snowden* 1582. Ninagongo, *Linder* 2145. Between Mts. Sabinio and Mgahinga, 2550 m., *Synge* 1255; 2550 m., *Longfield* 98; 2400 m. *Taylor* 1863. Muhavura, 3000 m., *Taylor* 1746. Ruchiga, *Bagshawe* 420.

36. P. Schliebenii *Mildbr.* in Notizbl. Bot. Gart. Berlin, **11,** 405 (1932). *P. oblongifolia* Bak. l.c. 385, quoad *Whyte* s.n. *P. Volkensii* Perk. l.c. 75, quoad *Whyte* s.n.

Tanganyika Territory. Iringa District; Lupembe, *Schlieben* 713 (type in Berlin Herb.). East Mufindi, 1930 m., *Greenway* 3491, and raised from seed at Kew. North of Lake Nyasa, *Whyte* s.n. Masuka Plateau, 1950–2100 m., *Whyte* s.n. Kyimbila, 2000 m., *Stolz* 2109.

37. P. Meyeri *Gürke* in Engl. Hochgebirgsfl. Afr. 362 (1892); Bak. l.c. 384; Perk. l.c. 73. *P. Volkensii* Gürke in Engl. Pflanzenw. Ost-Afr. **C.** 344 (1895); Bak. l.c.; Perk. l.c. 75 excl. *Whyte* s.n. *P. oblongifolia* Bak. l.c. quoad *Scott Elliot* 7883; Perk. l.c. 76. *P. bowalensis* A. Chev. in Journ. de Bot. **22,** 126 (1909). *P. longiacuminata* Perk. l.c. quoad specim. dextr. *P. longebracteata* De Wild. Pl. Bequaert. **4,** 388 (1928). *P. ovoidea-conica* De Wild. l.c. 396.

French Guinea. Fouta Djalon; Dalaba-Diaguissa Plateau, 1000–1300 m., *Chevalier* 18707. Between Dalaba and Mamou, *Chevalier* 20343.

British Cameroons. Cameroon Mt., *Preuss* 688; 2400–3000 m., *Johnston* 37. 2800 m., *Mildbraed* 10877; 2100 m. *Dunlop* 207; 1800 m. *Mann* 1222, 1960; 1800–2280 m., *Maitland* 643, 1020.

Fernando Po. Clarence Peak, 2700 m., *Mann* 280.

Belgian Congo. Ruwenzori; Lamuri, c. 1800 m., *Bequaert* 4490. Mukule-Mokoto, *Bequaert* 6325.

Abyssinia. Sidama; Lake Abassa, *Ellenbeck* 1728a, quoad specim. dextr.

Anglo-Egyptian Sudan. Imatong Mts.; Katire to Itiboe, 1800 m., *Thomas* 1621.

Uganda. Toro District; Wimi valley, *Scott Elliot* 7883. Ruwenzori; Mubuku valley, 1500 m., *Maitland* 942. Nyamgasani valley, 1950 m., *Synge* 1618. Mt. Elgon; Butandiga-Bulambuli, *Snowden* 1195. Ruwenzori, Bekoni, 2250 m., *Taylor* 2735. Kilembe 1200–1500 m., *Taylor* 2475. Forest near Kyanjoki, 1950 m., *Taylor* 3144.

Kenya Colony. Eastern Aberdares; Tuso, 2250 m., *Napier* 6073A. Southern foothills of Aberdares, Katamayo, 2550 m. *Taylor* 1060. Cherangani Hills; Pope's Nose, 2550 m., *Dale* 3381. Muhoroni, 1200 m., *Batiscombe* 277. 2nd day's march from Eldoma, *Whyte* s.n.

Tanganyika Territory. Kilimanjaro; Ruabach, 1900–2300 m., *Meyer* 279 (type in Berlin Herb.); *Schlieben* 5074. Marangu; Mawenzi, 2100 m., *Volkens* 823; 2000 m., *Volkens* 1293, 1899. Kilimanjaro; Bismark, 3000 m. *Grote* 8225. South Meru, c. 2800 m., *Uhlig* 616. Kingo-Kwai, *Braun* 2842, 3040. Usambara, Mlalo, *Holst* 3707. Kyimbila, 1800 m., *Stolz* 2041.

This is a widespread and very variable species, which contains a large range of material. The characters of indumentum and leaf-size fluctuate greatly within the species. The West African material is characterized by constantly pubescent leaves and

calyx-teeth but the leaf shape is variable. The Belgian Congo specimens include those with pubescent and glabrous calyx teeth but with fairly constant leaf-shape and indumentum. Among the East African specimens there are several combinations of these variations, e.g., small leaves, pubescent on the nerves and glabrous calyx-teeth (*Battiscombe* 277) and large glabrous leaves and glabrous calyx-teeth (*Napier* 6073). In view of these inconstancies the only possible solution is to treat the material as a single variable species.

Index to Species

(The number given is that in the enumeration. Synonyms are in *italics*.)

LXI—NOTES ON SOME MALAYAN RUBIACEAE.

H. N. RIDLEY.

GARDENIEAE.

The genus *Randia* as defined in the Genera Plantarum and Pflanzenfamilien includes a large series of very different plants, which have, however, been grouped into sections. One of these is Sect. *Anisophyllea* Hook. f., based on *Gardenia anisophylla* Jack, of the Malay Peninsula. I have raised this section to generic rank under the name *Porterandia*, commemorating the name of George Porter, who first collected *Randia anisophylla* in Penang.

The trees are of no great height, about 40 to 60 feet, with a large spreading head, growing in open lowlands. They have dense cymes of small white flowers, the corolla tube often hardly longer than the calyx and usually covered with silky hairs. The fruit is globular, about an inch through, with a thin green outer coat covering a thin woody one. The small flat seeds are enclosed in a white pithy substance.

Porterandia *Ridley*, gen. nov.

Arbores mediocres, dense comosi, saepe hirti. *Folia* subcoriacea, inaequalia, ovata vel ovato-lanceolata, saepissime hirta, longi-petiolata vel subsessilia. *Stipulae* coriaceae, majusculae, oblongae, obtusae vel rarius acuminatae, basibus breviter connatae, raro liberae, extra hirtae vel glabrae, intus pilis longiusculis barbatae. *Cymae* in axillis superioribus pedunculatae, rarissime sessiles, saepe multiflorae, hirtae. *Bracteae* minimae, ovatae, acutae. *Calyx* tubulosus, pubescens, dentibus 5 acutis. *Corolla* alba, tubo cylindrico extra sericeo calyce vix longiore, lobis 5 brevibus oblongis extra pubescentibus intus glabris. *Stamina* 5, filamentis brevissimis vel subnullis, antheris linearibus in medio tubo dorsifixis haud exsertis. *Stylus* tubo brevior, cylindricus, integer, clavatus. *Ovarium* biloculare, ovulis plurimis. *Bacca* globosa, saepe tubo calycis coronata, viridis, pericarpio tenui, endocarpio lignoso tenui. *Semina* plurima, parva, plana, semiovata, in pulpa alba immersa.

Randia Sect. *Anisophyllea* Hook. f. in Hook. f. Fl. Brit. Ind. **3,** 113 (1880), et in Benth. et Hook. f. Gen. Pl. **2,** 89 (1883).

Species 9 : Peninsula Malayana 2, Borneo 7.

Leaves hairy beneath, petiolate ; cymes compact, short :
Leaves large.....1. *P. anisophylla.*
Leaves small, 14–16 cm. long.....2. *P. minor.*
Leaves hairy, subsessile :
Leaves large ; stipules very large, bearded ; calyx strongly toothed.....3. *P. grandifolia.*
Leaves small ; stipules small ; calyx entire.....4. *P. subsessilis.*
Leaves glabrous, petiolate :
Cymes short, lax, many-flowered :
Leaves large, oblanceolate.....5. *P. Scortechinii.*
Leaves large, obovate, rounded.....6. *P. catappifolia.*
Cymes short, few-flowered ; leaves amall, lanceolate.....
7. *P. glabrifolia.*
Cymes elongate, few-flowered ; leaves oblanceolate.....
8. *P. pauciflora.*
Flowers sessile in sessile capitula ; leaves ovate or rotundate.....
9. *P. sessiliflora.*

1. **Porterandia anisophylla** (*Jack ex Roxb.*) *Ridley*, comb. nov. *Gardenia anisophylla* Jack ex Roxb. Fl. Ind. ed. Carey et Wall. **2,** 561 (1824) ; Wall. Cat. 8399A (1847–8) ; Miq. Fl. Ind. Bat. **2,** 230 (1857). *Randia anisophylla* (Jack ex Roxb.) Hook. f. in Hook. f. Fl. Brit. Ind. **3,** 114 (1880) ; King in Journ. As. Soc. Beng. **72,** 2, 209 (1903) ; Ridley, Fl. Mal. Pen. **2,** 77 (1923) ; S. Moore in Journ. Bot. **63,** Suppl. 50 (1925).

Malay Peninsula, very common : Singapore, Malacca, Selangor, Penang, Rhio.

Sumatra. Forest S. of Rupit river and E. of Suka Rajah, Palembang, *H. O. Forbes* 2954, 3088.

2. **Porterandia minor** *Ridley*, sp. nov., a *P. anisophylla* (Jack ex Roxb.) Ridley, cui affinis, foliis multo minoribus supra glabris, pedicellis longioribus, bracteis minoribus, corollae lobis brevioribus differt.

Arbor, ferme omnino glabra. *Folia* oblanceolata, breviter cuspidata, acuta, basibus longe attenuatis, supra glabra, subtus costa nervis et nervulis hirtis, majora 14–16 cm. longa, 6·5–7·5 cm. lata, minora 4–6 cm. longa, 2–5 cm. lata, petiolis hirtis 1·5–2 cm. longis. *Stipulae* lanceolatae, utrinque hirtae, acuminatae, 1 cm. longae. *Cymae* laxae, patentes, hirtae, ramis 3–4, 6 cm. longae, 6·5 cm. latae. *Bracteae* ovatae, acuminatae, 5 mm. longae. *Pedicelli* 5 mm. longi. *Calyx* cupularis, 6 mm. longus, dentibus 5 brevissimis vix 1 mm. longis. *Corollae* tubus cylindricus, appresse sericeo-hirtus, 1·5 cm. longus, lobis dorso albo-sericeis supra glabris 6 mm. longis 2 mm. latis.

Brunei. Limbang, *Haviland* 697 (c.o.c.m.).

Sarawak. Rejang, Belaga, *Haviland* 2161 (typus, Herb. Kew.); Miri, *Hose* 660.

This has much smaller nearly glabrous leaves, and the pedicels of the flowers longer, the flowers of *P. anisophylla* being nearly or quite sessile. The corolla lobes are also longer.

3. **Porterandia grandifolia** *Ridley*, sp. nov., a *P. anisophylla* (Jack ex Roxb.) Ridley, cui affinis, foliis sessilibus supra glabris, stipulis magnis intus albo-barbatis extra dense rufo-hirtis, floribus multo majoribus differt.

Arbor, ramulis hirtis. *Folia* coriacea, obovata vel oblanceolata, breviter apiculata, basibus angustatis, sessilia, supra costa elevata hirta excepta glabra, 13–30 cm. longa, 7–15 cm. lata, nervis 18-paribus cum costa elevata rufo-hirtis, nervulis transversis parallelis undulatis ; folia minora 9–18 cm. longa, 7–11 cm. lata. *Stipulae* oblongae, obtusae, 2–5 cm. longae, 1 cm. latae, extra dense rufo-hirsutae, intus pilis sericeis albis longis barbatae. *Flores* plures, in cymis compactis axillaribus sessiles. *Bracteae* ovatae, dense rufo-hirtae, 2 mm. longae. *Calyx* infundibuliformis, 1 cm. longus, viridis, dense pubescens, dentibus 5 acutis 2 mm. longis. *Corollae* tubus crassiusculus, superne sensim dilatatus, extra pubescens, intus glaber, 1·5 cm. longus, lobis 5 oblongis obtusis extra hirtis supra glabris 7 mm. longis 2 mm. latis. *Stamina* 5, filamentis brevissimis vix 1 mm. longis, antheris in medio tubo dorsifixis linearibus 9 mm. longis. *Ovarium* biloculare, ovulis paucis 3–4 pro loculo. *Stylus* validus, clavatus, 1·6 cm. longus. *Bacca* viridis, globosa, lignosa, puberula, 3·5 cm. longa, 3·4 cm. lata.

Sarawak. *Beccari* 760 ; near Kuching, *Haviland* 1892 (typus, Herb. Kew.), *Haviland & Hose* 3420.

This has much larger leaves than *P. anisophylla*, and they are sessile. The stem and stipules are covered with very dense red velvety hairs, and the stipules are remarkable for the long white hairs on the inner surface.

4. **Porterandia subsessilis** (*Valeton*) *Ridley*, stat. nov. *Gardenia anisophylla* Jack. var. *subsessilis* Valeton in Engl. Bot. Jahrb. **44,** 558 (1910).

This is allied to *P. grandifolia* Ridley in its subsessile leaves which, however, are smaller, the cymes are decurved on short thick peduncles, the calyx is softly pubescent, not hairy, with very short or no teeth, the corolla tube more narrowed to the base, 1·3–1·6 cm. long, the lobes 1 cm. long, longer than those of *P. grandifolia*. The stipules are elongate, ovate, acute, 2 cm. long, and not white-bearded inside.

It was found in Dutch Borneo at Hayup, *Winkler* 2563, between Lumo Sibak and Muarah Benangin, *Winkler* 2916, and between Lampeung and Patung, *Winkler* 3339.

5. **Porterandia Scortechinii** (*King et Gamble*) *Ridley*, comb. nov. *Randia Scortechinii* King et Gamble in Journ. As. Soc. Beng. **72,** 2, 210 (1903) ; Ridley, Fl. Mal. Pen, **2**, 78 (1923)

Malay Peninsula: Selangor, Negri Sembilan, Perak and Penang. Absent from the south of the Peninsula.

This tree has much the habit of *P. anisophylla*, but its leaves are completely glabrous and shining and attain a much greater size.

6. **Porterandia catappifolia** *Ridley*, sp. nov., a *P. Scortechinii* (King et Gamble) Ridley, cui affinis, foliis obovato-rotundatis, petiolis longis, calyce dense pallide hirto dentibus 5 differt.

Arbor ferme omnino glabra. *Folia* coriacea, glabra, obovata, apice lato rotundato, basibus longe attenuatis, majora 15–18 cm. longa, 10–11 cm. lata, petiolis 3 cm. longis, minora 6 cm. longa, 4·4 cm. lata, petiolis 1 cm. longis, nervis 11-paribus in minoribus 7-paribus utrinque conspicuis subtus cum costa et nervis transversis parallelis parce puberulis. *Stipulae* oblongae, acutae, 1 cm. longae, extra pubescentes, intus pilis paucis praeditae. *Cymae* laxae, hirtae, 2 cm. longae. *Bracteae* ovatae, acutae, hirtae, 1·5 mm. longae. *Pedicelli* hirti, 2 mm. longi, vel nulli. *Calyx* urniformis, 1 cm. longus, hirtus, dentibus 5 triangularibus acutis brevibus. *Corollae* tubus crassiusculus, cylindricus, extra sericeo-hirtus, intus glaber, 1 cm. longus; lobi oblongi, extra puberuli, intus glabri, 5 mm. longi. *Filamenta* brevissima, e medio tubo, antheris dorsifixis 4 mm. longis. *Stylus* crassus, stigmate clavato basi paullo dilatato sericeo, ceterum glaber, 1 cm. longus.

Sarawak. *Beccari* 2599 (Herb. Kew.).

This is allied to *P. Scortechinii* (King et Gamble) Ridley, of the Malay peninsula, but the leaves are obovate with a rounded top. There are traces of pubescence on the costa beneath, and the calyx has short distinct teeth. In *P. Scortechinii* the leaves taper somewhat towards the top and are completely glabrous, and the calyx has a completely entire margin.

7. **Porterandia glabrifolia** *Ridley*, sp. nov., a *P. catappifolia* Ridley, cui affinis, foliis parvis lanceolatis angustis, floribus paucis in cymis laxis differt.

Arbor, innovationibus exceptis glabra. *Folia* coriacea, lanceolata vel oblanceolata, basibus angustatis, apicibus breviter acuminatis, majora 11–12 cm. longa, 3–5 cm. lata, minora 6 cm. longa, 2 cm. lata, nervis 10-paribus, nervulis transversis paucis undulatis, petiolis 1 cm. longis. *Stipulae* lanceolatae, sericeae, 1 cm. longae. *Cymae* parvae, in axillis subterminalibus ortae, 5-florae, velutinae. *Bracteae* ovatae, 1·5 mm. longae. *Pedicelli* 2 mm. longi. *Calyx* infundibuliformis, sericeus, 6 mm. longus, dentibus 5 sublanceolatis acutis 1 mm. longis. *Corollae* tubus cylindricus, superne sensim dilatatus, velutinus, 1·3 cm. longus; lobi 5, puberuli, oblongi, 5 mm. longi, 2 mm. lati. *Antherae* apice exsertae. *Ovarium* biloculare.

Sarawak. *Beccari* 1686 (Herb. Kew.).

Very distinct from all other species in the small lanceolate glabrous leaves and small few-flowered cymes.

8. **Porterandia pauciflora** *Ridley*, sp. nov., a *P. sessiliflora* Ridley, cui affinis, cymis elongatis paucifloris pedunculatis, calyce multo majore dentibus longis differt.

Arbor glabra. *Folia* subcoriacea, glabra, oblanceolata, obtusa, minute cuspidata, basibus longe attenuatis, majora 20–21 cm. longa, 9 cm. lata, minora 9 cm. longa, 4 cm. lata, nervis ascendentibus in majoribus 6–9-paribus in minoribus 5-paribus, petiolis 3 cm. longis in minoribus 1 cm. longis. *Stipulae* coriaceae, oblongae, obtusae, basi connatae, extra glabrae, intus parce barbatae, marginibus hirtis. *Cymae* pauciflorae, elongatae, axillares, glabrae, 6 cm. longae, ramis 2–3 validulis 2 cm. longis. *Bracteae* lanceolatae, acuminatae, glabrae, 2 mm. longae. *Pedicelli* validi, 1 cm. longi. *Calyx* infundibuliformis, pubescens, 9 mm. longus, dentibus 5 subulatis acuminatis 2 mm. longis. *Corollae* tubus crassus, cylindricus, sericeus, 1 cm. longus ; lobi oblongi, rotundati, extra sericei, intus glabri, 3 mm. longi.

Sarawak. Niah, *Haviland & Hose* 3421 (Herb. Kew.).

This is certainly a tree, with leathery glabrous leaves, but with long few-flowered axillary cymes and a longer calyx with longer teeth than in *P. sessiliflora* Ridl.

9. **Porterandia sessiliflora** *Ridley*, sp. nov., a *P. Scortechinii* (King et Gamble) Ridley, cui affinis, glabritate, foliis remotis, floribus in capitulis axillaribus congestis sessilibus conspicue differt.

Arbor? glabra. *Folia* remota, coriacea, crassiuscula, ovata vel late rotundata, breviter cuspidata, basibus obtusis, glabra, 10–15 cm. longa, 7–8 cm. lata, nervis in utraque pagina elevatis 7–8-paribus, nervulis invisibilibus, petiolis 10–12 cm. longis. *Stipulae* coriaceae, glabrae, usque ad basin liberae, oblongo-lanceolatae, obtusae, 1·5 cm. longae. *Flores* in capitulis sessilibus axillaribus sessiles. *Bracteae* ovatae, marginibus ciliatis, 3 mm. longae. *Calyx* urceolato-tubulosus, glaber, viridis, margine obscure 5-lobato ciliato, 1 cm. longus. *Corolla* alba, sericea, tubo crasso cylindrico 1 cm. longo, lobis 5 extra sericeis ovato-rotundatis 3 mm. longis. *Stamina* 5, filamentis brevissimis, antheris oblongo-linearibus in medio tubo dorsifixis 5 mm. longis. *Stylus* brevis, crassus, superne clavato-fusiformis. *Bacca* globosa, glabra, tubo calycis coronata, 2–2·5 cm. longa, bilocularis, septo lignoso, pericarpio lignoso. *Semina* plura.

Sarawak. Kuching, calyx green, corolla white, 25 Nov. 1892, *Haviland* 1961 ; ibid., 9 Oct. 1894, *Haviland & Hose* " =1961 " A (typus, Herb. Kew.), " =1961 " K ; ibid., 31 Oct. 1894, *Haviland & Hose* " =1961 " Z.

Sumatra. Indragiri, Sungei Laloh, *Curtis* 3543.

Mussaendeae.

Mussaenda lanuginosa *Ridley*, sp. nov., a *M. sumatrensi* Roth, cui affinis, floribus minoribus paucioribus in cymis laxioribus, sepalis longioribus, petalis angustioribus acutis, alabastris acutis nec globosis differt.

Frutex, ramis ferrugineo-hirtis. *Folia* membranacea, elliptica, breviter vel longiuscule acuminata, basi longius attenuata decurrente, supra sparse setulosa, 9–13 cm. longa, 4–7 cm. lata, carina subtus elevata cum nervis 9-paribus et nervulis transversis undulatis conspicuis hirta, petiolis dense ferrugineo-hirtis 1·5–2 cm. longis. *Stipulae* bifidae, basibus triangularibus, lobis lanceolatis longe acuminatis, extra hirtae, 7 mm. longae. *Cymae* subterminales, hirtae, pauciramosae, pedunculis 4 cm. longis, ramis 2–3 cm. longis. *Bracteae* lanceolatae, acuminatae, subulatae, extra rufo-hirtae, 4 mm. longae. *Calycis* tubus urceolatus, hirtus, 3 mm. longus, lobis subaequilongis lanceolatis acuminatis hirtis, lobo phyllomorpho albo ovato subabrupte acuminato obtuso basi breviter attenuato trinervio 6 cm. longo 4 cm. lato sparse setuloso, nervis densius hirtis, nervulis conspicuis, petiolo 1·5 cm. longo gracili hirto. *Corolla* extra viridis, lobis rubris mox luteis, tubo gracili hirto cylindrico 2·5 cm. longo, lobis lanceolatis 3 mm. longis extra sericeis.

Sarawak. Kuching, corolla green externally, segments red internally, later becoming yellow, *Haviland* 2870 (typus, Herb. Kew.) ; Kuching, Saheb, *Ridley* 16318.

Mussaenda sumatrensis *Heyne ex Roth*, Nov. Pl. Sp. 152 (1821).

This plant which, like many other species, has been referred to *M. frondosa* L., is probably identical with the plant described by me as *M. hirsuta* in Journ. As. Soc. Mal. **1,** 68 (1923). The latter is the commonest species in Sumatra and has also been collected in Sarawak at Lio Matu, Upper Baram, by *Moulton* (no. 6702). Roth gives no locality for the species, which was based on Heyne's specimens, but, from the name given it by the collector, it is, I presume, Sumatran.

Mussaenda celebica *Ridley*, sp. nov., a *M. angustisepala* Ridley, cui affinis, foliis basi rotundatis, cymis laxis, calycis lobis tubo subaequilongis differt.

Frutex puberulus, pilis longiusculis sparse dissitis. *Folia* membranacea, elliptica, cuspidato-acuminata, basibus rotundatis. supra areolata, glabra, 10·5–11 cm. longa, 5·5–6 cm. lata, costa subtus elevata cum nervis 8-paribus pilosa, petiolis pilosis 5 mm. longis. *Stipulae* integrae, late triangulares, acuminatae, pilosae, 5 mm. longae. *Cymae* elongatae, pilosae, multiflorae, 6–9 cm. longae. *Bracteae* lineares, acuminatae, pilosae, 5 mm. longae. *Calyx* pilosus, tubo fusiformi 5 mm. longo, lobis linearibus angustissimis aequilongis, lobo phyllomorpho albo ovato subobtuso basi breviter attenuato supra costa excepta glabro subtus piloso 7-nervio 9 cm. longo 8 cm. lato, petiolo hirto 1·2 cm. longo. *Corolla* extra sericea, tubo superne dilatato 1·5 cm. longo intus albo-sericeo, lobis ovatis obtusis 4 mm. longis. *Filamenta* 2 mm. longa ; antherae lineares, 5 mm. longae.

S. W. Celebes. Malino, 280 metres, *Bünnemeyer* 10772 (Herb. Kew.).

The flowers in this specimen are all males.

Mussaenda Motleyi *Ridley*, sp. nov., *M. grandiflorae* Rolfe affinis, sed calycis lobis multo majoribus cum corollae tubo puberulis exceptis ferme glabra.

Frutex ferme glaber. *Folia* membranacea, ovato-elliptica, subacuta, basibus attenuatis decurrentibus, pilis paucis in costa exceptis glabra, 7–7·5 cm. longa, 3–4·2 cm. lata, nervis 6-paribus, nervulis transversis pluribus subparallelis undulatis, petiolis glabris 1 cm. longis. *Stipulae* bifidae, longe lineares, acuminatae, pubescentes, 4 mm. longae. *Cymae* pauciramosae, pedunculis 1 cm. longis pubescentibus. *Calycis* tubus obconicus, pubescens, 1 mm. longus, lobis oblongo-linearibus acutis 7 mm. longis 1 mm. latis, lobo phyllomorpho albo ovato obtuso basi breviter attenuato decurrente supra glabro 7 cm. longo 5 cm. lato, costa nervisque subtus sparse pilosis, petiolo gracili 2 cm. longo. *Corollae* tubus cylindricus, superne dilatatus puberulus, 3 cm. longus; lobi 5, subtriangulares, minute apiculati, 6 mm. longi, 3 mm. lati, superne papillosi.

Dutch S. E. Borneo. Banjermasin, *Motley* 695 (Herb. Kew.).

Asemanthia (*Stapf*) *Ridley*, gen. nov.

Frutices ramosi, 2–3 m. alti. *Folia* membranacea, ovata vel lanceolata, petiolata. *Stipulae* triangulares, acutae. *Flores* speciosi, plures in cymis sessilibus terminalibus. *Bracteae* lanceolatae, parvae. *Calyx* subsessilis, tubo brevi, lobis 5 lanceolatis similibus parvis. *Corollae* tubus longus, cylindricus, superne paullum dilatatus, in ore villosus; lobi 5, magni, valvati, lanceolato-triangulares, acuti, tubo ferme aequilongi, superne primo rubri, dein flavi vel aurantiaci. *Stamina* 5, in medio tubo vel infra villositate tubi sita, filamentis brevissimis, antheris linearibus apiculatis elongatis prope bases dorsifixis. *Stylus* elongatus vel brevis, gracilis, filiformis, stigmatibus 2 linearibus acuminatis papillosis. *Discus* annularis. *Ovarium* oblongum, breve, ovulis pluribus. *Bacca* viridis, oblonga, saepe sepalis coronata. *Semina* plurima.

Mussaenda Sect. *Asemanthia* Stapf in Trans. Linn. Soc. ser. 2, **2**, 173 (1894), in obs.

Species **4**: Peninsula Malayana 2, Borneo 2.

This name was proposed by Stapf for a small number of plants originally described as belonging to the genus *Mussaenda* but differing in the large size of the corolla and in the absence of the white phyllomorphic calyx lobes so conspicuous in that genus. For these plants, occurring in the Malay Peninsula and Borneo, I propose to retain Stapf's name generically. There are also some plants in Tropical Africa, e.g., *Mussaenda elegans* Schum. et Thonn., which seem closely allied to this genus and might perhaps be referred to it.

1. **Asemanthia Maingayi** (*Hook. fil.*) *Ridley*, comb. nov.

Acranthera Maingayi Hook. fil. in Hook. fil. Fl. Brit. Ind. **3,** 92 (1880).

Acranthera Griffithii Hook. fil. l.c.

Mussaenda mutabilis Hemsl. in Hook. Icon. Pl. **18,** t. 1718 (1887) ; Ridley, Fl. Mal. Pen. **2,** 58 (1923).

Malay Peninsula.

The specimens described as *Acranthera Griffithii* Hook. fil. were unlocalised in Griffith's herbarium but on account of the paper they were found in were believed to have been obtained by Griffith in the Eastern Himalayas, probably Sikkim. No species of the genus *Asemanthia* has been found by any collector in that area since. The plant is identical with that of the Malay Peninsula, and there can be little doubt that it was obtained by Griffith in Malacca.

2. **Asemanthia spectabilis** (*Ridley*) *Ridley*, comb. nov.

Mussaenda spectabilis Ridley in Journ. Roy. As. Soc. Str. Br. **79,** 78 (1918) ; Fl. Mal. Pen. **2,** 59 (1923).

Malay Peninsula. Pulau Tioman, coast of Johor.

3. **Asemanthia coccinea** (*Stapf*) *Ridley*, comb. nov.

Mussaenda coccinea Stapf in Trans. Linn. Soc. ser. 2, **4,** 171 (1894).

Borneo. Kinabalu (Haviland), Dahombang River (Low), Sarawak (Beccari), Kalaka (Bartlett).

4. **Asemanthia Lobbii** *Ridley*, sp. nov., ab *A. Griffithii* (Hook. fil.) Ridley, cui affinis, foliis lanceolatis glabris, bracteis minoribus lanceolatis, sepalis brevissimis, tubo corollae longiore differt.

Frutex metralis, glaber. *Folia* chartacea, glabra, lanceolata, acuminata, acuta, basibus attenuatis, 13–15 cm. longa, 5·5–6 cm. lata, nervis puberulis elevatis 8-paribus, petiolis 1–1·5 cm. longis. *Stipulae* triangulares, acutae, pubescentes, 5 mm. longae. *Cymae* sessiles, subterminales, binae, sexflorae. *Bracteae* lanceolatae, acuminatae, pubescentes, 5 mm. longae. *Flores* speciosi, sessiles. *Calycis* tubus obconicus, pubescens, 1 cm. longus ; lobi 5, lanceolati, acuti, pubescentes, 2 mm. longi. *Corolla* rubra, tubo cylindrico 3 cm. longo appresse hirto ore flavo-villoso, lobis 6 ovato-lanceolatis acutis, nervis extra hirtis. *Stamina* 5–6 in medio tubo, filamentis brevibus, antheris linearibus. *Stylus* gracilis, 2·5 cm. longus, stigmatibus 2 linearibus 5 mm. longis. *Bacca* oblonga, 1 cm. longa.

Sarawak. Shrub 5 feet, *Lobb* (typus, Herb. Kew.) ; Mount Buan, limestone, shrub, corolla segments red, *Haviland* 2028 ; Bidi, limestone, colour orange, *C. J. Brooks* 7.

Morindeae.

Prismatomeris *Thwaites.*

A genus of shrubs, rarely treelets, about 4 to 15 feet tall, with lax spreading branches, the branchlets covered by a thin fawn-coloured bark which readily peels off ; leaves thinly or rather

thickly coriaceous, lanceolate to ovate, acute or subacute, nerves few, inarching within the margins ; flowers in umbels, terminal, rarely axillary also, white, pendulous, fragrant ; pedicels usually long, slender, more rarely short ; calyx urn- or cup-shaped, with 5 short teeth or entire ; corolla tube long slender or short, lobes 5 very rarely 4, linear or lanceolate ; fruit pisiform, purple or black, 1- rarely 2-seeded.

Species about 20, ranging from Assam to the Philippine Islands, most abundant in Siam.

The genus was based on an endemic Ceylon plant, *P. albidiflora* Thwaites. Unfortunately Hooker in Fl. Brit. Ind. **3,** 159 (1880), gave as a synonym *Coffea tetrandra* Roxb., an entirely different species, native of Assam (*Prismatomeris tetrandra* (Roxb.) K. Schum. emend. Ridley), and Valeton identified *Coffea glabra* Korthals of Borneo as a *Prismatomeris* and recorded it also as *P. tetrandra* Val. Most of the species of the genus when discovered have been referred to *P. albidiflora* Thw.

The species may be separated into (A) those with subsessile flowers ; (B) those with long-pedicelled flowers, with long-tubed corolla, type form *P. tetrandra* K. Schum. ; (C) those with long pedicels and short-tubed flowers with broader corolla lobes.

(A) *P. mollis* Craib, Siam ; *P. subsessilis* King et Gamble, Malay Peninsula ; *P. sessiliflora* Pierre, Indo-China ; *P. Griffithii* Ridley, Tenasserim ; *P. lepidophloia* Ridley, Banca and Borneo ; *P. brachypus* Ridley, Philippines.

(B) *P. tetrandra* K. Schum., Assam, Yunnan ; *P. malayana* Ridley, Malay Peninsula, Siam ; *P. multiflora* Ridley, Siam ; *P. glabra* Val., Borneo ; *P. ovalifolia* Ridley, Anambas Islands ; *P. memecyloides* Craib, Siam.

(C) *P. albidiflora* Thw., Ceylon ; *P. parviflora* Ridley, Mergui, Cambodia, Malay Peninsula ; *P. Parkinsonii* Ridley, Tenasserim ; *P. obtusifolia* Merrill, Philippines ; *P. neurophylla* Ridley, Banca, Borneo ; *P. fragrans* Geddes, Siam ; *P. Harmandi* Pierre, Annam, Cambodia ; *P. filamentosa* Craib, Siam, Cambodia ; *P. javanica* Ridley, Java ; *P. andamanica* Ridley, Andamans.

Excluded from the genus are :

P. Henryi (Lévl.)Rehd. (*Canthium Henryi* Lévl. ; *P. brevipes* Hutch.). China. *P. linearis* Hutchinson. China.

Prismatomeris lepidophloia (*Miq.*) *Ridley*, comb. nov.

Coffea lepidophloia Miquel, Fl. Ind. Bat. Suppl. 548 (1860).

Species a *P. malayana* Ridley, cui affinis, floribus subsessilibus, calycis dentibus glandulosis, corollae tubo infra limbum dilatato differt.

Frutex glaber, cortice pallido desquamato. *Folia* coriacea, rigidula (sicca flavescentia), elliptica vel ovato-lanceolata, acuminata, basibus angustatis, 8·5–16 cm. longa, 4·5–7 cm. lata, nervis

6-paribus supra inconspicuis subtus cum secundariis et reticulationibus elevatis conspicuis inter se intra margines inarcuantibus, petiolis crassis 5 mm. longis. *Stipulae* coriaceae, flavescentes, carinatae, ovatae, acutae, inferne connatae. *Flores* albi, fasciculati, terminales, 5–6 in fasciculo, subsessiles. *Bracteae* ovatae, coriaceae, carinatae, 2 mm. longae. *Pedicelli* 1 mm. longi vel nulli. *Calyx* obconicus, limbo cupulato 2 mm. longo, dentibus 5 minutis, marginibus glandulosis. *Corolla* alba, tubo 1 cm. longo crassiusculo, lobis lanceolatis obtusis 5 mm. longis. *Stamina* 5, antheris lineari-oblongis. *Stylus* brevis, lobis stigmaticis oblongo-linearibus stylo ferme aequilongis. *Drupa* globoso-ovoidea, 7 mm. longa. *Semen* unicum, globosum.

SUMATRA. Siak, Sungei Kelantan, *Ridley* 8967.

BANCA. *Teysmann* (typus).

SARAWAK. Kuching, *Haviland* 615, 2980.

I have not seen Miquel's type, collected in Banca by Teysmann, but I have no doubt that the Borneo and Sumatra plants described above are identical. The subsessile flowers with glandular calyx and stiffer ovate leaves are very characteristic. The style is remarkably short and the rather large stigmatic lobes nearly as long.

Prismatomeris brachypus *Ridley*, sp. nov., a *P. lepidophloia* (Miq.) Ridley, cui affinis, floribus multo majoribus, pedicellis longioribus, foliis tenuioribus oblongo-lanceolatis differt.

Frutex, ramulis validulis. *Folia* subcoriacea, oblongo-lanceolata, obtusa, breviter cuspidata, basibus attenuatis, 15 cm. longa, 4·5 cm. lata, costa utrinque elevata crassiuscula, nervis primariis 8-paribus tenuibus intra margines inarcuantibus, secundariis tenuioribus aeque conspicuis, reticulationibus laxis, petiolis 1·5 cm. longis. *Stipulae* coriaceae, acuminatae, acutae, 3 mm. longae. *Umbella* pedunculo crasso 5 mm. longo suffulta, pedicellis crassis 2 mm. longis. *Calyx* urniformis, 2 mm. longus, dentibus 5 minutis. *Corollae* tubus crassiusculus, 1·5 cm. longus ; lobi 5 lineares, acuti, 1·2 cm. longi. *Filamenta* brevissima, antheris oblongo-linearibus. *Stylus* validulus, lobis stigmaticis oblongis.

PHILIPPINES. Luzon : Province of Cagayan, Jan. 1912, *H. M. Curran* 17784 (Herb. Kew.).

P. tetrandra (*Roxb.*) *K. Schum.* in Engl. et Prantl, Nat. Pflanzenfam. IV. **4,** 138 (1891), partim. *Coffea tetrandra* Roxb. Fl. Ind. ed. Carey et Wall. **2,** 193 (1824). *Octotropis terminalis* C. B. Clarke in Journ. Linn. Soc. **25,** 33, t. 17 (1889).

This plant was well described by Roxburgh, and there is an excellent painting of it by him in the Kew Library. Hooker referred the species to *P. albidiflora* Thw., and Schumann l.c. puts *P. albidiflora* as a synonym of *P. tetrandra*.

Though usually pentamerous, forms occur in which the flowers are tetramerous, as Roxburgh points out. They are usually few, five or six in an umbel, but sometimes as many as 13.

Yunnan. *Henry* 13573.

Assam. Khasiya, Silhet, *Wallich* 6242; Chittagong, *Hooker & Thomson*; Bocajan, Naga hills, *C. B. Clarke*.

var. **philippinensis** *Ridley*, var. nov.

Folia rigidiora, latiora, 10–15 cm. longa, 3–5 cm. lata. *Stipulae* brevius cuspidatae. *Flores* minores, 3–4. *Calyx* basi angustatus. *Corolla* brevior, lobis 5 mm. longis.

Philippines. Luzon, Tayabas, *Ramon* 13187, 13315.

Prismatomeris multiflora *Ridley*, sp. nov., a *P. tetrandra* (Roxb). K. Schum., cui affinis, floribus pluribus, pedicellis brevibus, calyce margine integro differt.

Frutex 4-metralis, ramis patentibus angulatis cortice cervino tectis. *Folia* subcoriacea, elliptico-lanceolata, longe acuminata, acuta, basibus attenuatis, 12–16 cm. longa, 4·5–6 cm. lata, nervis tenuibus 8–9-paribus intra margines inarcuantibus, petiolis 1 cm. longis. *Stipulae* dentibus 2 acutis 2 mm. longis instructae. *Umbellae* terminales, sessiles, 9–12-florae; umbellae laterales paucae, 4–7-florae. *Pedicelli* 5 mm.–1 cm. longi, graciles. *Calyx* cupuliformis, margine integro, 2 mm. longus, ore 2 mm. lato. *Corolla* alba, fragrans, tubo cylindrico 2–2·5 cm. longo, lobis 4 rarius 5 lanceolato-linearibus 1–1·4 cm. longis 3 mm. latis. *Stamina* 4 vel 5, in ore tubi, filamentis 1 mm. longis, antheris linearibus apiculatis 3 mm. longis apicibus projicientibus. *Stylus* gracilis, brevis, 6 mm. longus vel 1·2 cm. longus, lobis stigmaticis lanceolato-linearibus obtusis. *Drupa* globosa, 1 cm. longa (sicca).

Siam. Doi Angka Noi, near summit, 1540 metres, evergreen jungle, shrub about 3·5 m., 27 June 1927, *Garrett* 390 (typus, Herb. Kew.). Me Song, alt. 210 m., shrub 0·6 m. high, *Luang van Pruk* 305. Doi Sootep, Chieng Mai, 420 m., by a stream, a thin shrub, 1·2 m., 17 June 1909, *Kerr* 683A. Muang Kaurj, Chingdao, 900 metres, about 2 m. high, *Kerr* 5536. Doinang Ka, Chiengmai, fruit Nov. 17, *Put* 3455.

Certainly near *P. tetrandra*, but with many more flowers on much shorter pedicels, and an entire calyx. Most of the flowers are tetramerous but some are pentamerous. The style seems to vary in length and the plants are probably heterostyled. The filaments are shorter than in *P. tetrandra*.

Prismatomeris ovalifolia *Ridley*, sp. nov., a *P. malayana* Ridley, cui affinis, foliis majoribus ovalibus, floribus majoribus, corollae lobis lanceolatis acuminatis basibus latioribus, umbella pedunculata differt.

Frutex glaber, ramis 7 mm. crassis, ramulis angulatis. *Folia* subcoriacea (sicca supra fusca nitida, subtus olivacea), ovata, acuta, basibus latis brevissime attenuatis, 9–13 cm. longa, 4–6 cm. lata, nervis 6-paribus in utraque pagina elevatis gracilibus, secundariis et reticulationibus parvis inconspicuis, petiolis 1 cm. longis. *Stipulae* triangulares, bicuspidatae, cuspidibus nigris, coriaceae,

flavescentes, 4 mm. longae. *Pedunculi* axillares et terminales, 2·5–4 cm. longi. *Flores* 2–6 in umbella patente. *Bracteae* minutae, ovatae, cuspidatae. *Pedicelli* graciles, 1 cm. longi. *Calyx* obconicus, 4 mm. longus, dentibus 5 acutis. *Corollae* tubus cylindricus, 6 mm. longus, lobis 5 lanceolatis acuminatis furfuraceis 9 mm. longis 2 mm. latis.

Anambas Islands. Tanjong Suka, Siantan, on rocks at sea-level, *Henderson* 20228 (typus, Herb. Kew.) ; same locality, *Van Steenis*.

This is very distinct from all others in the oval leaves drying black, and the peduncled umbel. The stamens and pistils have been destroyed by insects in the only flowering specimen I have seen.

P. glabra (*Korth.*) *Valeton* in Engl. Bot. Jahrb. **44,** 569 (1910).

Coffea glabra Korth. in Nederl. Kruidk. Arch. **2,** 2, 254 (1851).

Species a *P. neurophylla* Ridley, cui affinis, foliis tenuioribus angustioribus nervis pluribus inconspicuis, floribus paucis, pedicellis longioribus, calyce urniformi differt.

Frutex, ramulis cortice cervino desquamantibus. *Folia* tenuiter coriacea, lanceolata, utrinque acuminata, acuta, subtus pallidiora, 10–14 cm. longa, 3–4·6 cm. lata, costa utrinque elevata in pagina superiore canaliculata, nervis tenuibus subconspicuis 7-paribus prope margines inarcuantibus, petiolis rugosis 2–3 mm. longis. *Stipulae* triangulares, acute cuspidatae, in vaginam decurrentes, circiter 2 mm. longae. *Flores* 2–3 in umbella terminali dispositi, pedicellis 4–5 mm. longis (sub fructu 1 cm. longis). *Calyx* urniformis, 2 mm. longus, lobis brevibus glandulosis. *Corollae* tubus gracilis, 1·2 cm. longis ; lobi 5, valvati, lineares, acuti, 1 cm. longi. *Antherae* 5, lineari-oblongae. *Stylus* gracilis, 5 mm. longus, tubo aequilongus, lobis stigmaticis 1·5 mm. longis oblongis. *Drupa* pisiformis, 5 mm. longa (sicca).

Sarawak. *Beccari* 1825.

Dutch S. E. Borneo. Martapura, *Korthals* (typus) ; Hayup, *Winkler* 2331, 2543.

Korthals' description of his *Coffea glabra* is too incomplete to identify even the genus, but Valeton identifies Winkler's plants with it and has apparently seen Korthals' type. He refers it properly to the genus *Prismatomeris* but gives no description at all. I have seen Winkler's no. 2331, which is only in fruit, and have carefully compared it with Beccari's flowering plant from Sarawak, which seems in foliage and general habit to be identical.

P. albidiflora *Thw.* in Hook. Journ. Bot. Kew Gard. Misc. **8,** 269 (1856) ; Trimen, Handb. Fl. Ceyl. **2,** 355 (1894).

This species occurs rarely in the moist regions of Ceylon and was distributed by Thwaites under the number 728, collected in 1846. A variety *Fergusoni* (Bedd.) Trim. (*P. Fergusoni* Beddome, Fl. Sylv. For. Man. cxxxiv–10 : 1873) was described from plants collected at Colombo by Ferguson ; of this I have seen no specimen.

It is described as having 5 to 10 flowers in the umbels and less fleshy corolla-lobes, and Beddome states that the latter were imbricate.

In the Kew Herbarium I find, also under *Thwaites* 728, Ceylon, but collected in 1866, a plant which appears quite different from *P. albidiflora* Thw. It has bigger, more lanceolate leaves, 10 cm. long and 4 cm. wide, pedicels 5 in an umbel, very slender, 1·5 cm. long, calyx very much smaller and limb saucer-shaped, margin entire, 2 mm. long, 1·5 mm. wide, corolla lobes rather longer than the tube, whole corolla 1·7 cm. long, style 1·5 cm. long.

In the type form of *P. albidiflora* Thw. the leaves are ovate, 7 cm. long, 3·5 cm. wide, the pedicels of the umbel 1 to 3, rather stout and 2·5 cm. long, calyx cup-shaped obscurely toothed, 5 mm. long, and 3 mm. wide, corolla tube 1 cm. long, lobes 5 mm. long, style 1·5 cm. long. The different leaves, more numerous pedicels and entirely different shape and size of the calyx, in the plant collected in 1866, are very striking. It is possible that this is the var. *Fergusoni*.

Prismatomeris parviflora Ridley, sp. nov., a *P. Harmandi* Pierre, cui affinis, foliis minoribus tenuioribus, floribus parvis axillaribus et terminalibus, pedicellis longioribus, calyce dentato differt.

Frutex metralis, ramis gracilibus pallidis desquamantibus. *Folia* pergamacea, lanceolata, acuminata, basibus cuneatis, 7–12 cm. longa, 2–4·5 cm. lata, nervis gracilibus 8-paribus in utraque pagina conspicua, petiolis 2–10 mm. longis. *Stipulae* 3 mm. longae, coriaceae, flavescentes, ovatae, cuspidatae. *Flores* in umbella 4–6, axillares vel terminales, pedicellis gracillimis 1·5 cm. longis. *Calyx* cupulatus, 2 mm. longus, dentibus 5 acutis. *Corollae* tubus 4 mm. longus, crassiusculus, lobis 5 oblongo-lanceolatis obtusis carnosis 4 mm. longis. *Stamina* 5, filamentis in ore tubi brevibus, antheris oblongis minute apiculatis 3 mm. longis. *Stylus* 6 mm. longus, gracilis. *Discus* circularis, elevatus.

Malay Peninsula. Perlis, at Chupeng, *Ridley* 15000 (typus, Herb. Kew.). Penang, shrub 1·8–2·4 m., *King's Collector* 1567. Mergui, *Griffith*.

Cambodia. Knang Requen, crescit in montibus, *Pierre* 672. Montagnes de Pursat, *Godefroy Lebeuf* 553.

This has the smallest flowers of any known and is also remarkable for the thin texture of the leaves, which usually dry black.

Prismatomeris Parkinsonii *Ridley*, sp. nov., a *P. albidiflora* Thw., cui affinis, floribus majoribus pluribus, pedicellis brevioribus, calyce minore, lobis corollae late lanceolatis differt.

Arbor parva, 5-metralis, cortice albescente. *Folia* chartaceo-coriacea, tenuia, elliptica, acute acuminata, 6 cm. longa, 3·3 cm. lata, nervis gracilibus 7–10-paribus, reticulationibus subtus minute conspicuis elevatis, petiolis 1 cm. longis. *Stipulae* subtriangulares, acute cuspidatae. *Flores* terminales, 5–7-umbellatae, pedicellis

1–1·4 cm. longis. *Calyx* urniformis, basi attenuata, 2 mm. longus, dentibus 5 acutis. *Corollae* tubus crassus, 1 cm. longus, lobis 5 lanceolatis obtusis 1 cm. longis basi 2 mm. latis. *Stamina* 5, filamentorum parte libera brevissima, antheris lineari-oblongis. *Stylus* longior, filiformis, lobis stigmaticis 2 linearibus exsertis.

TENASSERIM. About sea level at Nyaungbinkin, *Parkinson* 1933 (Herb. Kew.).

Vernacular name : *pa the po* (Karen).

This species is very remarkable from the corolla-lobes being lanceolate, broad at the base and tapering to a blunt point.

Prismatomeris javanica (*Valeton*) *Ridley*, stat. nov.

P. albidiflora Thw. var. *javanica* Valeton in Bull. Inst. Bot. Buitenz. **8,** 6 (1901) et Bijdr. Boomsoorten Java, **8,** 201 (1902).

P. tetrandra K. Schum., sec. Valeton, Atl. Baumarten Java, **3,** t. 560 (1915), non K. Schum., nec *Coffea tetrandra* Roxb.

This species, apparently confined to Java, is well figured in the "Baumarten." It is entirely distinct both from *P. albidiflora* Thwaites and from *Coffea tetrandra* Roxb. (*Prismatomeris tetrandra* (Roxb.) K. Schum. emend. Ridley) of northern India. It is a small tree, about 15 feet tall, with the corolla-tube short and thick and hardly longer than the five lanceolate lobes, and the anthers projecting beyond the mouth, whereas *C. tetrandra* Roxb., of which there is an excellent coloured drawing by Roxburgh in the Kew library, is a shrub, with a long slender tube, and four or five narrow acuminate lobes, much shorter than the tube, in which the 4 or 5 stamens are rather deeply sunk.

In *P. javanica* (Valet.) Ridley the leaves are thin-textured as in *P. malayana* Ridley, the stipules have bifid lobes, the flowers are long-pedicelled, the calyx teeth 5, short, acute, the corolla short, the lobes thick, lanceolate, subobtuse.

Prismatomeris neurophylla (*Miq.*) *Ridley*, comb. nov.

Coffea neurophylla Miq. Fl. Ind. Bat. **2,** 1079 (1859).

Species a *P. malayana* Ridley, cui affinis, foliis majoribus coriaceis, pedicellis longioribus, calyce margine glanduloso, corollae lobis oblongis brevioribus tubo subaequilongo differt.

Frutex, ramis subangulatis pallidis. *Folia* rigida, coriacea, ovata vel ovato-lanceolata, acuminata, acumine obtuso, basibus breviter angustatis, 5–10·5 cm. longa, 3–4 cm. lata, nervis 5-paribus tenuibus conspicuis subtus elevatis, costa subtus elevata crassiuscula, petiolis 5 mm. longis. *Stipulae* triangulares, carinatae, cuspidatae, 2 mm. longae. *Flores* in ramulis brevissimis pseudo-axillares, 6–7 in umbella, pedicellis gracilibus 1 cm. longis. *Calyx* campanulatus, 2 mm. longus, dentibus brevibus acutis glandulosis. *Corolla* alba, 1·5 cm. longa, tubo cylindrico 5 mm. longo, lobis 5 lanceolatis obtusis 4 mm. longis. *Stamina* 5, in tubo inclusa, antheris oblongis elongatis. *Stylus* 6 mm. longus, lobis oblongis obtusis. *Drupa* pisiformis.

Banca. *Horsfield* (typus).

Dutch S.E. Borneo. Banjermasin, *Motley* 913, 1286.

This plant is noticeable from the umbels of flowers being borne on such short axillary branches that they themselves appear to be axillary. This occurs too in *P. malayana* Ridley to some extent, but actually terminal flowers on the ends of fully developed branches also occur on these.

Prismatomeris andamanica *Ridley*, sp. nov., a *P. fragrante* Geddes, cui affinis, foliis multo majoribus ovalibus, floribus pedicellatis in pedunculis tribus terminalibus, corollae lobis linearibus acuminatis differt.

Arbor parva, cortice ramorum albescente. *Folia* coriacea, elliptica, breviter obtuse cuspidata, basibus breviter cuneatis, 14–15 cm. longa, 6–7 cm. lata, summa minora, nervis 5–6-paribus gracilibus, petiolis 1 cm. longis. *Stipulae* rigidae, coriaceae, acute bifidae, subtriangulares, 4 mm. longae. *Flores* albi, pedunculis 3 terminalibus 1·9 cm. longis, pedicellis in pedunculo medio 3 in lateralibus 2 brevibus crassis 2 mm. longis. *Calyx* campanulatus, 5 mm. longus, 3 mm. latus, integer. *Corollae* tubus crassiusculus, 2 cm. longus, cylindricus, lobis 5 linearibus acuminatis recurvis 2 cm. longis. *Stamina* 5, in ore corollae affixa, antheris linearibus 2 mm. longis. *Stylus* filiformis, 1·3 cm. longus, lobis linearibus.

Andamans. Long Island, small tree, *C. E. Parkinson* (typus, Herb. Kew.). S. Andaman, *Kurz*.

Allied to *P. fragrans* Geddes, of Siam, but the lower leaves are very much larger and coriaceous, the biggest leaves in any species known to me. The flowers are borne on three peduncles, umbellate in the terminal axils; the central peduncle has three pedicellate flowers, the two side ones two each. The corolla lobes are linear, acuminate, recurved. In *P. fragrans* Geddes there is no peduncle, all the flowers being borne in separate pedicels. It resembles this species in the tree-like habit, broad entire calyx and general shape of the flowers.

Rennellia *Korth.*

Low shrubs, rarely tree-like, with showy fragrant violet flowers in racemes or rarely panicles. The flowers connate by the calyces in twos, threes, or fours on a peduncle, 4- or 5-merous. Korthals described his genus *Tribrachya* as being tetramerous and the *Rennellias* as pentamerous, but the genus varies much in this respect.

The species occur in jungle from S. Tenasserim to Siam, the Malay Peninsula, Borneo and Sumatra.

Inflorescence racemose:

Low shrublet; capitula crowded in a short raceme, flowers 5-merous.....*R. speciosa* Hook. fil.

Big shrubs ; raceme elongate :
Capitula sessile :
Flowers 5-merous ; stems smooth.....
R. elongata (King et Gamble) Ridley.
Flowers 4-merous ; stems pustulate.....
R. borneënsis Baill. ex Ridley.
Capitula remote on long peduncles, flowers 4-merous.....
R. morindiformis (Korth.) Ridley.
Inflorescence paniculate ; tree.....*R. paniculata* King et Gamble.

Dubiae. *R. elliptica* Korth. in Nederl. Kruidk. Arch. **2,** 2, 257 (1851) ; Miq. Fl. Ind. Bat. **2,** 248 (1857) (*Morinda sumatrana* Miq. in Ann. Mus. Bot. Lugd.-Bat. **4,** 213 : 1868–9). Allied to *R. elongata*, but 4-merous. Sumatra.

R. ovalis Korth. l.c. ; Miq. Fl. Ind. Bat. l.c. Sumatra.

Rennellia elongata (*King et Gamble*) *Ridley*, stat. nov.

R. speciosa Hook. fil. var. *elongata* King et Gamble in Journ. As. Soc. Beng. **73,** 90 (1904).

Species a *R. speciosa* Hook. fil., cui affinis, statura majore, foliis oblongis majoribus, racemo elongato, corollae lobis linearibus angustis longioribus differt.

Frutex 3-metralis vel elatior. *Folia* coriaceo-carnosa, oblonga, breviter acuminata, basibus angustatis, 27 cm. longa, 11 cm. lata, nervis 7–8-paribus subtus elevatis intra margines inarcuantibus, petiolis 2–3 cm. longis. *Stipulae* basi connatae, cupuliformes, lobis 2 acutis. *Capitula* sessilia, remotiuscula, in rhachi 8–11 cm. longa disposita. *Calyx* cupulatus, puberulus, 4 mm. longus. *Corolla* purpurea, tubo gracili puberulo 2–4 cm. longo basi dilatato, lobis 5 linearibus 1 cm. longis. *Stamina* 5, filamentis brevissimis, antheris versatilibus. *Ovarium* subglobosum, 2-loculare. *Stylus* linearis. *Bacca* globosa, purpurea.

Malay Peninsula. Prov. Wellesley : Ara Kudah, *Ridley*. Perak : Larut Hills, *Kunstler* 3926. Selangor : Ulu Gombak, *Ridley* ; Semangkok Pass, *Curtis*. Johor : Ulu Kahang, *Holttum* 10934.

Sumatra. Kayu Tanam, *Curtis* 48 : " shrub, 6 to 8 feet tall, purple flowers."

Sarawak. Matang, *Haviland* 224 : " corolla purple, berry purple." Ibid., *Ridley* 11747.

This plant is very distinct from *R. speciosa* Hook. fil., of which King and Gamble made it a variety. The whole shrub is considerably larger, and the leaves much bigger, while the inflorescence is an elongate raceme, not a condensed tuft, and the flowers are longer with much narrower thinner corolla-lobes. It may be the plant intended by Korthals under the name *Renellia elliptica* Korth. (Nederl. Kruidk. Arch. **2,** 2, 255), but his description is insufficient and I have seen no type.

Rennellia borneënsis (*Baill.*) *Ridley*, comb. nov. cum descr. amplif.

Morinda borneënsis Baillon in Bull. Soc. Linn. Par. **1,** 205 (1879), *nomen subnudum.*

Species a *R. elongata* Ridley ramis petiolis calyce pustulatis, foliis lanceolatis acutis tenuioribus, capitulis breviter pedicellatis, corolla minore lobis oblongis obtusis differt.

Frutex, ramis atro-brunneis pustulatis. *Folia* coriacea, oblongo-lanceolata, acuminata, basibus angustatis obtusis, 23–24 cm. longa, 6·4–10 cm. lata, nervis 9-paribus intra margines arcuantibus cum secundariis et reticulationibus subtus elevatis, petiolis 1 cm. longis pustulatis. *Stipulae* coriaceae, flavescentes, in cupulam 4 mm. longam connata, lobis 2 late ovatis. *Racemus* 10 cm. longus. *Capitula* triflora, breviter pedicellata, 1 mm. longa, 4 mm. dissita. *Calyx* vix 2 mm. longus, obconicus, pustulatus, limbo obscuro dentibus 5 minutis. *Corolla* minute pubescens, 1·7 cm. longa, lobis 5 obtusis lanceolato-oblongis carnosis 6 mm. longis. *Antherae* 3 mm. longae. *Ovarium* subglobosum, biloculare, biovulatum.

Sarawak. *Beccari* 2060 (typus, Herb. Kew.) ; near Kuching, *Haviland* 1690 ; Matang, *Haviland* 1704.

The pustulate branches, petiole and calyx, lanceolate stiff leaves and smaller corolla with shorter thicker blunt lobes distinguish this plant at once from *R. elongata* Ridley. Beccari's specimen, the type, is only in young bud ; Haviland's are in flower. The plant has never previously been described.

Rennellia morindiformis (*Korth.*) *Ridley*, comb. nov.

Tribrachya morindaeformis Korth. in Nederl. Kruidk. Arch. **2,** 2, 255 (1851) ; Miq. Fl. Ind. Bat. **2,** 247 (1857) ; Boerl. Handl. Fl. Ned. Ind. **2,** 1, 95 (1891).

Morinda Korthalsiana Miq. in Ann. Mus. Bot. Lugd.-Bat. **4,** 212 (1868–9).

Frutex " pseudo-parasiticus." *Folia* tenuia, acuminata, basibus angustatis, 10–14 cm. longa, 4·2 cm. lata, nervis 6–8-paribus 3–5 mm. a margine inarcuantibus, petiolis 1·5 cm. longis. *Stipulae* 4 mm. longae, in cupulam connatae, apicibus acutis brevibus. *Capitula* 3-flora, in racemo 4·5 cm. longo disposita, ramis 1·5 cm. longis. *Calyx* cylindricus, 2 mm. longus, margine scarioso, sessilis. *Corolla* 1 cm. longa, " alba," " tubo brevissimo," lobis 5 " lanceolatis trigonis valvatis." *Stamina* 5, ad faucem inserta, filamentis brevissimis antheris oblongis dorsifixis. *Discus* carnosus, annularis. " *Stylus* teres, stigmate indiviso cylindrico-clavato basi excavato."

Sumatra. Mt. Singalan, *Korthals.*

The words in " " are taken from Korthals' description. I suppose " pseudo-parasiticus " means epiphyticus. The description is mainly taken from a syntype in Herb. Kew.

Zeuxanthe *Ridley*, gen. nov.

Arbores vel *frutices*, ramulis cortice pallido desquamato obtectis. *Stipulae* simplices vel bifidae. *Folia* chartacea vel pergamacea, lanceolata, acuminata. *Flores* 2–3 in apicibus radiorum gracilium

umbellae ope calycum connati. *Calyx* oblongus vel obconicus, dentibus 5. *Corolla* alba, tubulosa, lobis angustis tubo subaequilongis. *Stamina* 5, in ore tubi affixa, filamentis brevibus, antheris oblongis vel linearibus ad dorsum basifixis. *Ovarium* biloculare, ovulis in loculo singulis. *Stylus* corollae tubo brevior, saepe bifidus.

Species 3, Borneënses.

This genus is based on *Morinda Beccariana* of Baillon (Bull. Soc. Linn. Par. **1,** 205 : 1879), who cited it as the type of his section *Dibrachia* of *Morinda*. It has also been referred to *Morinda* by Schumann in Engler and Prantl, Nat. Pflanzenfam. IV. **4,** 138. It has, however, no real affinity with *Morinda* beyond its flowers being in connate pairs or threes. It is allied to *Prismatomeris*, from which it only differs in the connate flowers. *Morinda Beccariana* Baill. was only described very briefly, so it is necessary to give a more complete description of it. There are two other species of the genus, both likewise from Borneo. *Dibrachia* is antedated as a generic name by *Dibrachya* Ecklon et Zeyher, Enum. 74 (1835) (=*Pelargonium* spp.).

Folia tenuia, lanceolata :

Arbor ; stipulae bifidae.....1. *Z. Beccariana.*

Frutex ; stipulae ovatae, integrae...2. *Z. Moultonii.*

Folia coriacea, late elliptica.....3. *Z. prismatomeriformis.*

1. **Zeuxanthe Beccariana** (*Baill.*) *Ridley*, comb. nov. cum descr. amplif.

Morinda Beccariana Baill. in Bull. Soc. Linn. Par. **1,** 205 (1879) ; Boerl. Handl. Fl. Ned. Ind. **2,** 1, 95 (1881).

Arbor, ramulis angulatis, cortice pallido desquamato. *Folia* chartacea (sicca supra olivacea, subtus flavescentia), elliptico-lanceolata, longe acuminata, acuta, basibus angustatis, 6·5–10·5 cm. longa, 2–3·5 cm. lata, nervis gracilibus subtus elevatis 8-paribus 2 mm. a margine inarcuantibus, nervis secundariis et reticulationibus subtus conspicuis, petiolis 7 mm. longis. *Stipulae* bifidae, lobis lanceolatis acuminatis 4 mm. longis. *Flores* pauci, saepissime terni, pedunculis 3 terminalibus 7 mm.–1 cm. longis. *Calyces* connati, oblongi, dentibus 5 acutis, 2 mm. longi. *Corollae* tubus cylindricus, 1·4 cm. longus, lobis 5 lanceolatis acuminatis 1·5 cm. longis. *Stamina* 5, filamentis brevissimis, antheris oblongis minute apiculatis. *Stylus* cylindricus, elongatus, lobis stigmaticis 2 oblongis obtusis. *Ovarium* triloculare, biovulatum.

Sarawak. *Beccari* 1994, 2238 ; Matang, a tree, *Haviland* 656.

2. **Zeuxanthe Moultonii** *Ridley*, sp. nov., a *Z. Beccariana* (Baill.) Ridley, cui affinis, foliis basi rotundatis, stipulis integris ovatis, floribus pluribus minoribus in umbella pedunculata differt.

Frutex glaber, ramis superne 4-angulatis flavescentibus. *Folia* pergamacea (sicca olivacea), lanceolata, cuspidato-acuminata, basibus rotundatis, 9–15 cm. longa, 3–4 cm. lata, nervis 8-paribus in utraque pagina elevatis 3 mm. intra marginem inarcuantibus, nervis

secundariis pluribus brevioribus, reticulationibus parvis, petiolis 3 mm. longis. *Stipulae* coriaceae, ovatae, 3 mm. longae, flavescentes. *Pedunculus* terminalis, angulatus, flavescens, 1–1·5 cm. longus. *Umbellae radii* 14, graciles, puberuli, 1 cm. longi. *Flores* in apicibus 2, connati. *Calyces* obconici, puberuli, connati, 2 mm. longi, dentibus 5 brevibus acutis. *Corolla* alba, extra puberula, 1·2 cm. longa, tubo gracili, lobis 5 anguste linearibus 4 mm. longis. *Stamina* 5, in ore tubi inserta, filamentis brevibus, antheris oblongis obtusis 2 mm. longis basin versus dorsifixis. *Stylus* linearis, tubo brevior, apice integro.

Sarawak. Upper Baram, Lio Matu, 150 m., flowers white, *Moulton* 6719 (typus, Herb. Kew.).

Brit. N. Borneo. Bettotan, plain, alt. 22·5 m., 29 March 1933, *Orolfo* in *For. Dept.* 2858 : " Tree, 10 ft. high, 6 in. girth ; flower white." Vernacular name : *kopi-kopi* (Kedayan).

3. **Zeuxanthe prismatomeriformis** (*Merr.*) *Ridley*, comb. nov. *Rennellia prismatomeriformis* Merrill in Univ. Calif. Publ. Bot. **15,** 296 (1929).

Brit. N. Borneo. Tawao, Elphinstone Prov., *Elmer* 20599, 20831.

Hedyotideae.

Hedyotis Everettii *Ridley*, sp. nov., ab *H. buruensi* (Miq.) Val., cui affinis, foliis majoribus, floribus majoribus in cymis pedunculatis terminalibus dispositis differt.

Herba glabra, ramosa, sicca viridis, ultra 30 cm. alta. *Folia* herbacea, lanceolata, obtusa, basibus rotundatis vel acutis, 3–5·5 cm. longa, 1·5 cm. lata, nervis 6-paribus, costa supra depressa subtus elevata, petiolis 3 mm. longis. *Stipulae* triangulares, lobis 3 subulatis marginibus fimbriatis. *Cymae* pedunculatae, pedunculis 5 mm.–1 cm. longis, pauciflorae. *Bracteae* herbaceae, lanceolatae, 3 mm. longae. *Flores* in umbellis dispositi, 3–4 pro umbella, pedicellis 1–2 mm. longis. *Calycis* tubus urceolatus ; lobi 4, triangulari-lanceolati, acuminati, virides, 2 mm. longi. *Corolla* vix longior, tubo brevissimo, lobis oblongis obtusis. *Stamina* 4, filamentis brevibus, antheris fuscis oblongis obtusis minute appendiculatis. *Capsula* laevis, elliptica, 3 mm. longa.

Celebes. Bonthain Peak, 2100-3000 m. alt., *A. H. Everett* 36 (Herb. Kew.).

Hedyotis pinaster *Ridley*, sp. nov., ab *H. tenelliflora* Bl., cui affinis, caule erecto sublignoso simplici, foliis latioribus densis, fructibus minoribus differt.

Herba suffruticosa, erecta, 5–12 cm. alta, vix ramosa, caule sublignoso basi foliis delapsis nudo, internodiis 2–4 mm. longis. *Folia* crassiuscula, anguste lanceolata, glabra, enervia, utrinque acuminata, 2·5–3 cm. longa, 4 mm. lata, petiolis 5 mm. longis. *Stipulae* lanceolatae, hirtae, 3 mm. longae. *Flores* parvi, usque 10 in glomerulis subsessilibus axillaribus dispositi. *Calyx* campanulatus, lobis 4 ovatis. *Corolla* deest. *Capsula* ovoideo-globosa, laevis, sepalis incurvis coronata, 1 mm. longa.

Sarawak. Upper Baram, Lio Matu, *Moulton* 6734 (Herb. Kew.).

Hedyotis anachoreta *Ridley*, sp. nov., ab *H. pedunculari* Ridley, cui affinis, foliis latioribus, capitulis haud pedunculatis, calycis lobis longioribus recurvis differt.

Herba simplex, glabra, 14–27 cm. alta, caule angulato, internodiis 3 cm. longis. *Folia* herbacea, oblongo-lanceolata, acuta, basibus acuminatis, 1·5–4 cm. longa, 4 mm.–1 cm. lata, nervis 2-paribus subtus elevatis, petiolis 2 mm. longis. *Stipulae* lanceolato-lineares, integrae, 4 mm. longae, liberae. *Flores* albi, in glomerulis sessilibus densis 8 mm. latis in axillis superioribus et uno terminali dispositi. *Pedicelli* brevissimi. *Calyx* urceolatus, lobis 4 lineari-subulatis spinulosis 1 mm. longis. *Corolla* 2 mm. longa, tubo cylindrico, lobis 4 multo brevioribus oblongo-linearibus. *Stamina* 4, antheris oblongis ex ore tubi extrusis. *Capsula* laevis, ellipsoidea, 3 mm. longa, sepalis 4 persistentibus recurvis terminata, bilocularis. *Semina* pauca, ellipsoidea, atro-brunnea, transversim rugosa.

Sarawak. On a grassy spot on the top of Mt. Matang, July 1903, *Ridley* 11745 (Herb. Kew.).

I gathered this plant again in the same spot in January 1915, but it had then become very scanty. I only saw a few plants left. The species is closely allied to *H. pedunculatis* Ridley, of Kedah Peak in the north of the Malay Peninsula. There are some other allied species, both in the latter area and in Siam, with very similar inflorescences, most of them from dry or high mountain regions, but I know no others of this group in the Malay Archipelago or beyond it.

Hedyotis Moultonii *Ridley*, sp. nov., ab *H. flexuosa* Ridley, cui affinis, foliis lanceolatis, calycis lobis anguste linearibus acuminatis differt.

Herba glabra, ascendens, 32 cm. alta. *Folia* subcarnosa, lanceolata, acuminata, basibus angustatis, 7 cm. longa, 1 cm. lata, nervis invisibilibus, petiolis 2 mm. longis. *Stipulae* triangulares, acuminatae, marginibus denticulatis, 3 mm. longae. *Cymae* axillares et terminales, laxae, 3–7·5 cm. longae, pedunculis gracilibus, ramis paucis brevibus. *Bracteae* foliaceae, 1 mm. longae; bracteolae lineares, 4 mm. longae. *Flores* parvi, albi, pedicellis gracillimis 2–3 mm. longis. *Calyx* urceolatus, lobis 4 anguste linearibus acuminatis tubo longioribus 1 mm. longis. *Corolla* non visa. *Capsula* obovoidea, bilocularis, 2 mm. longa, calycis lobis coronata.

Sarawak. Summit of Mt. Murud, *Moulton* 119 (Herb. Kew.).

This is allied to *H. flexuosa* Ridley, of the Malay Peninsula, but the calyx lobes are very narrow, linear and longer than the tube. The capsule much resembles that of *H. stolonifera* Ridley, but the whole habit of the plant is different. The only specimen collected is a poor one.

Hedyotis coronata *Wall.*

Brit. N. Borneo. Kudat, *Fraser.*

Not previously recorded from Borneo.

Oldenlandia stolonifera *Ridley*, sp. nov., ab *O. santubongensi* W. W. Smith, cui affinis, foliis rosulatis sessilibus elongatis, caule gracili radicante differt.

Herba repens, caule gracili elongato, internodiis 5–6 cm. longis, nodis radicantibus. *Folia* crassiuscula, sessilia, congesta, glabra, lineari-oblonga, acuminata, apicibus glandulis singulis terminatis, basibus paullum angustatis, 15 cm. longa, 2–2·4 cm. lata, nervis 3-paribus inconspicuis costae subparallelis. *Stipulae* lanceolatae, 5 mm. longae, marginibus denticulatis. *Paniculae* axillares, graciles, elongatae, laxae, hirtae, 8–15 cm. longae, ramis paucis remotis 5 cm. longis, ramulis 3 umbellatis 1–3 cm. longis. *Flores* pauci, albi, pedicellis 2 mm. longis. *Bracteae* lanceolatae, 1 mm. longae. *Calyx* urceolatus, 3 mm. longus, dentibus 4 triangulari-lanceolatis acuminatis. *Corolla* 7 mm. longa, hirta, tubo 3 mm. longo, lobis 4 ovatis 4 mm. longis. *Stamina* 4, e tubo corollae vix protrusa, antheris oblongis utrinque obtusis. *Stylus* corolla longior, gracilis, filiformis, stigmatibus 2 crassis obtusis obconicis. *Capsula* ob-ovoidea, hirta vel glabra, 2 mm. longa, sepalis coronata, bilocularis. *Semina* plurima, angulata, atra.

Sarawak. *Beccari* 981; Mt. Singhi, on rock, corolla white, *Haviland* 2151 (typus, Herb. Kew.).

This plant is unique in the genus in having a long slender creeping stem, emitting large tufts of narrow sessile leaves at intervals. Haviland's specimens have short hairy pubescence on the panicle, calyx and fruit; the other specimens are glabrous. It is certainly allied to *Oldenlandia santubongensis* W. W. Smith, as well as to the paniculate mountain forms of *Hedyotis*.

LXII—NEW SPECIES OF LOMARIOPSIS.

R. E. Holttum (Botanic Gardens, Singapore).

During a recent period of leave in Europe, I attempted a study of all known species of the genus *Lomariopsis*, which extends throughout the wetter parts of the tropics. This study is a continuation of earlier work on the climbing acrostichoid ferns of the Malayan region, which covered only a part of the genus. The present paper includes descriptions of such new species as appear to be represented among the available specimens, with the exception of those from Madagascar, which are to be published elsewhere. I hope later to prepare a full comparative survey of the genus.

The Directors of the following herbaria have kindly lent specimens for study, or have granted me facilities for work: Berlin (B.), the British Museum (Natural History) (B.M.), Brussels (Br.), Cambridge (C.), Kew (K.), New York (N.Y.), Paris (P.), and the U.S. National Herbarium (W.). I wish to express my thanks for this

assistance, particularly to the Director and staff at Kew, where most of the work was carried out. The abbreviations given in brackets above are used in citing specimens.

The general characters of the genus in the Malayan region were described in my paper of 1932 (Gardens Bulletin, Straits Settl. **5,** 264–266), and a study of the species from the other parts of the tropics has not revealed any considerable modification. The chief differences to be noted are in young plants, in the apical pinna of certain species, and in the spores.

Young plants in many species have fronds with several small pinnae, the apical one not greatly larger than the lateral ones. The type of young plant which has at first large simple fronds, followed later by fronds with an increasing number of lateral pinnae, universal among Malayan species, occurs also in other parts of the tropics, side by side with the other type. It is to be noted that, as in other climbing ferns with simply pinnate leaves, the characters of the young plants are often more distinctive than those of the adult stage, and the species cannot be understood fully without a study of them.

The *apical pinna* of nearly all species of *Lomariopsis* is continuous with the rachis, whereas all lateral pinnae are articulated. In three species from Cuba and Jamaica (see figs. 1, 2), and in two species from Madagascar, the apical pinna is almost or completely aborted (often represented by a small rudiment), and the apical position is taken by an articulated pinna which, morphologically, should be considered as a lateral one.

The *spores* of all species of *Lomariopsis* appear to have a perispore, but not all have the same copious convoluted envelope as that which surrounds the spores of the Malayan species. Some species in the American tropics have almost smooth spores, while others have a more or less well-developed spiny covering; still others have flattened appendages of irregular size and shape, these providing an intermediate stage between the spiny condition and the complete envelope. The spore characters are often important diagnostically.

The Species of Cuba and Jamaica with Aborted Apical Pinnae.

The following key will serve to distinguish the three species in this group. *L. Underwoodii* is a new species, described below; **L. jamaicensis** (*Underw.*) *Holtt.* is a new combination, based on *Stenochlaena jamaicensis* Underw. in Bull. Torr. Bot. Cl. **33,** 595 (1906).

Annulus of about 20 cells, spores twice as long as broad:

Pinnae up to about 7 pairs, very narrow at base.....*L. Wrightii*

Pinnae up to about 14 pairs, wider at base.....*L. Underwoodii*

Annulus of 12–14 cells, spores ovoid.....*L. jamaicensis*

Lomariopsis Underwoodii *Holttum*, sp. nov. (figs. 1, 2); affinis *L. Wrightii*, a qua pinnis 14-jugis basi multo latioribus differt;

a *L. jamaicensi* sporangiorum annulo e cellulis 20 constato, sporis elongatis valde distincta.

Rhizome and bases of *stipes* covered with red-brown, spreading, lanceolate scales. *Stipes* about 16 cm. long. *Sterile lamina* up to 60 cm. long, pinnae up to 14 pairs, lowest few pairs somewhat reduced, apical pinna aborted or represented by a small rudiment. *Pinnae* at about 60° to rachis, largest about 14 cm. long by 2·5 cm. wide, shortly stalked, base unequally narrowly cuneate, edges almost parallel, shortly and irregularly toothed throughout, more deeply near apex ; apex suddenly narrowed and then caudate, cauda 15 mm. long ; texture stiff, subcoriaceous ; colour brown when dry ; veins clearly raised on both surfaces. *Fertile pinnae* up to 14 pairs, apical pinna aborted, basal pinnae hardly reduced ; pinnae stalked up to 4 mm. ; largest about 11·5 cm. long and 5 mm. wide, base more or less rounded, apex gradually attenuate. *Sporangia* with annulus of about 20 cells ; spores long-ellipsoid, about twice as long as broad, surface granular but not spiny.

Young plants have fronds with small pinnae ; e.g., a frond 21 cm. long (including the stipe) is 9-jugate, the largest pinna being about 4·5 cm. long and 1·3 cm. wide ; the edges of the pinnae more toothed than in the adult plant, and the rachis winged throughout. A very young plant in the British Museum herbarium has a 6-jugate frond 9 cm. long, and pinnae with edges toothed almost as in young plants of *L. sorbifolia*, the apical pinna being continuous with the rachis.

Jamaica. *Jenman* s.n. (type, N.Y.). *Hart* 333 (W.). Near Troy, 450–600 m., *Underwood* 2866 (N.Y., W.), 2887 (N.Y.). Mabess River, 900 m., *Underwood* 1242 (N.Y.). Below Tweedside, 600 m., *Underwood* 1609 (N.Y.). Gossamer Park, St. Thomas, 750–900 m., *Maxon* 9222 (N.Y., W). Above Tweedside, 600–900 m., *Maxon* 968 (W). *Purdie* s.n., 1843 (N.Y., K). *Bot. Dept. Jamaica* s.n., 1885 (W). Herb. Langlois, leg. *I.H.*, 1885 (W). *Wilson* 750, " high mts. and very moist places " (K). *Harris* 7727 (K). *G. C. Joad* s.n. (K).

Cuba. Loma San Juan, 900 m. *Hioram* 6998 (W). Loma del Gato & vicinity, Cobra range of Sierra Maestra, *Leon, Clement & Bioca* 10385 (N.Y., W).

The species is named in honour of the late L. M. Underwood, who collected young plants and thought them distinct from *L. jamaicensis*, but in the absence of adult material was unable to describe them himself. The very fine series of specimens collected by Jenman and now in the New York herbarium show the species to be a very distinct one ; in some characters more nearly allied to *L. Wrightii* than to *L. jamaicensis*. It is, however, very distinct from *L. Wrightii* in the shape of the pinnae and in their much greater number. Its occurrence on the mountains in the south-east of Cuba (the part nearest Jamaica) is of interest.

L. Underwoodii differs from *L. jamaicensis* not only in the sporangia and spores, but also in the much greater number of pinnae

1. *L. Underwoodii* (Jenman, NY). Apex of sterile frond, with rudimentary terminal pinna. 2. *L. Underwoodii* (Jenman, NY). Apex of fertile frond. 3. *L. sorbifolia* (Guadeloupe, *Duss* 4139, NY). Frond of young plant. 4. *L. nigropaleata* (Peru, *Klug* 2082, NY). Fertile frond. 5. *L. nigropaleata* (Peru, *Klug* 2082, NY). Sterile frond.

on the fronds of adult plants (only about 7 pairs in *L. jamaicensis*), the more coriaceous texture of the pinnae, the sterile pinnae longer and narrower at the base, and the fertile pinnae also longer. Young plants of the two species are not always easy to distinguish ; on the whole, young plants of *L. jamaicensis* have fewer, larger pinnae of thinner texture, but there are some specimens which I could not clearly assign to one species or the other. It is probable that field workers will find a good distinction.

The Group of L. sorbifolia.

The species of this group are characterized by having young plants with numerous small lateral pinnae with more or less sinuate or toothed margins (fig. 3), and fronds of adult plants with rather numerous, narrow pinnae and a rachis winged almost throughout, the spores almost smooth or covered with flattened appendages. The species range over the Antilles, and from southern Mexico southwards through Central America to Brazil. The following belong to the group :

1. **L. amydrophlebia** (*Slosson*) *Holttum*, comb. nov. *Stenochlaena amydrophlebia* Slosson apud Maxon in Journ. Wash. Acad. Sci. **14,** 141 (1924).
2. *L. Fendleri* D. C. Eaton in Mem. Am. Acad. II. **8,** 195 (1860).
3. **L. Kunzeana** (*Underw.*) *Holttum*, comb. nov. *Olfersia Kunzeana* Presl, Tent. Pterid. 235 (1836) (nom. nud.). *Stenochlaena Kunzeana* Underw. in Bull. Torr. Bot. Club, **33,** 196 (1906).
4. **L. latiuscula** (*Maxon*) *Holttum*, comb. nov. *Stenochlaena latiuscula* Maxon in Contr. U.S. Nat. Herb. **10,** 502 (1908).
5. **L. Maxoni** (*Underw.*) *Holttum*, comb. nov. *Stenochlaena Maxoni* Underw. in Bull. Torr. Bot. Club, **33,** 599 (1906).
6. **L. mexicana** *Holttum*, sp. nov. (description below).
7. *L. recurvata* Fée, Hist. Acrost. 68, t.28 (1845).
8. *L. sorbifolia* (Linn.) Fée, Hist. Acrost. 69 (1845). *Acrostichum sorbifolium* Linn. Sp. Plant. 1069 (1753).
9. *L. vestita* Fourn. in Bull. Bot. Soc. France, **19,** 250 (1872).

Lomariopsis mexicana *Holttum*, sp. nov.

Rhizoma stipesque ignota. *Rhachis* pallide straminea, fere usque ad basin alata, glabrescens vel paleis linearibus brunneis sparsis munita. *Lamina sterilis* c. 42 cm. longa et 18 cm. lata ; pinnae c. 12-jugae, 2·5–3 cm. inter se distantes, e rhachi angulo fere recto ortae, superiores et inferiores quam mediae leviter minores. *Pinnae steriles* mediae usque 10 cm. longae et 2·5 cm. latae, basi e petiolulo alato 1 mm. longo subito dilatatae, late rotundato-cuneatae, postice quam antice latiores, margine minute sinuosae, apicem versus subito contractae, apice breviter caudatae vel subcaudatae ; textura tenues ; colore siccitate pallide virides ; venae pallidae, graciles, supra et subtus prominentes, angulum 70° cum costa efformantes, c. 1·2 mm. inter se distantes. *Pinnae fertiles* c. 13-jugae, usque 12 cm. longae et 3 mm. latae, petiolulis alatis 1–2 mm. longis munitae, basi late rotundatae, apice acuminatae.

Mexico. " Forêt vierge de Patrero, 19 août '65, Herb. de la Commission scientifique de Mexique, recueilli par *M. Hahn*, 1865–1866, no. 56 " (type, P.). Estado de Vera Cruz, La Junta, c. 100 m., *H. Ross* 1112, in Herb. Bonaparte. " Croît le long des arbres dans les forêts près de Tabasco " (Br.).

The type specimen was recognised by Underwood (Bull. Torr. Bot. Cl. **33,** 603) as representing a distinct species, which, however, he compared to *L. erythrodes*, whereas its relationship appears to me to be with *L. sorbifolia*, from which species indeed it may be difficult to find a clear distinction. The geographical separation of Mexico from the Lesser Antilles, where alone *L. sorbifolia* is known to occur, and the absence of *L. sorbifolia* from the extensive collections made in Cuba, indicates a quite distinct distribution for the two species. The clearest distinction may be in the shape of the fertile pinnae. From *L. recurvata*, the most nearly related species in Mexico, *L. mexicana* differs in the shorter sterile pinnae with much broader base, and in the wider fertile pinnae.

The Group of L. japurensis.

So far as at present known, the young plants of this group of species have at first simple lanceolate fronds, which reach a considerable length (20 to 30 cm.) before fronds with lateral pinnae appear. The sterile fronds of adult plants have usually broad pinnae, and the rachis is winged towards the apex only. Spores are either almost smooth or covered with spines. The species range widely in continental America from Guatemala southwards to Bolivia and Brazil, but are absent from the West Indies. The species at present known are as follows :

1. *L. elongata* Fée, Hist. Acrost. 67 (1845).
2. *L. erythrodes* (Kze.) Fée, Hist. Acrost. 67 (1845). *Acrostichum erythrodes* Kze. in Flora, **22** (1), Beibl. 46 (1839).
3. *L. japurensis* (Mart.) J. Sm., Hist. Fil. 140 (1875). *Acrostichum japurense* Mart. Ic. Pl. Crypt. Bras. 86, pl. 24 (1834).
4. **L. lanceolata** *Holttum* (described below).
5. **L. nigro-paleata** *Holttum* (described below).
6. *L. Prieuriana* Fée, Hist. Acrost. 66, pl. 25, fig. 1 (1845).
7. **L. speciosa** *Holttum* (described below).

L. japurensis is the most widespread species of the group, and is also the one best represented in collections, particularly in the U.S. National Herbarium. The species of southern Brazil, of which two are here described as new, need much further field study. They are apparently closely related, and present a problem quite similar to that of the allied group of species in West Africa.

L. nigro-paleata *Holttum*, sp. nov. (figs. 4, 5) ; *L. japurensi* affinis, sed paleis brevibus nigris adpressis, pinnis sterilibus plerumque latioribus petiolulatis, pinnis sterilibus et fertilibus basi angustius cuneatis, sporis spinulosis differt.

Scales on rhizome and bases of stipes appressed, up to about 4 mm. long, black, with red-brown margins formed of irregular hairs; small red-brown scales, irregularly orbicular, also present, giving a rusty appearance to the lower part of the stipe. *Stipes* up to 25 cm. long; sterile lamina up to about 70 cm. long and 30 cm. wide, pinnae about 8 pairs below the terminal pinna, lowest pinnae somewhat reduced. *Sterile pinnae* oblique, up to about 17 cm. long by 5 cm. wide, base subequally cuneate, rather narrow, sides parallel, apex mucronate-caudate, the narrowed tip 15–20 mm. long, edges very slightly sinuate; texture firm papyraceous, colour olive green when dry, paler beneath, surfaces glabrous except for scattered brown stellate hairs beneath; stalk about 3 mm. long; veins simple or forked, at about 70° to the costa, about 1·2 mm. apart. Fertile pinnae about 10 pairs, stalked as are the sterile ones up to about 12 cm. long by 1·2 cm. wide, cuneate, widest near base and gradually tapering to apex, apex suddenly contracted, the narrow terminal portion up to about 8 mm. long, sterile. *Spores* shortly ellipsoid, densely spinulose, the spines up to half the length of the spore.

Peru. Dept. Loreto: Florida, Rio Putumayo, at mouth of Rio Zubineta, alt. 200 m., forest, *G. Klug* 2082 (type, W. Syntypes in N.Y., K, B.M.). Santa Rosa, Lower Rio Huallaga, 135 m, dense forest, *Killip & Smith* 28823 (N.Y., W), 28794 (N.Y., W), Balsapuerto, Lower Huallaga basin, 150–350 m., *Killip & Smith* 28594 (N.Y., W).

Dept. Junín: Cahuapanas, on Rio Pichis, 340 m., dense forest, *Killip & Smith* 26754 (N.Y., W).

Prope Tarapoto, E. Peru, *Spruce* 4738 (K, P, C, W).

Brazil. Rio Juruá, *E. Ule* 5757 (B, K).

This species is clearly distinguishable from *L. japurensis* in the characters mentioned in the Latin diagnosis. It has so far only been collected in Peru and western Brazil, but may perhaps also occur in the adjacent parts of Colombia and Ecuador. There is no information about young plants. Some specimens differ from the type in having stalks of sterile pinnae up to 6 mm. long, and fertile pinnae up to 14 by 1·5 cm.

Lomariopsis lanceolata *Holttum*, sp. nov.; *L. erythrodi* affinis, sed pinnis sterilibus pro rata angustioribus, e basi fere truncata sensim attenuatis, colore pallidioribus, pinnis fertilibus angustioribus (usque 6 mm. latis) differt.

Rhizome unknown. *Stipes* incomplete, apparently about 10 cm. long, light brown when dry, when young bearing red-brown scales 2·5 mm. wide, dark at the peltate base, paler towards the acuminate apex. *Rachis* not winged, light brown, bearing some broad scales and many small long-fimbriate brown peltate scales. *Lamina* about 70 cm. long and 30 cm. wide; pinnae subsessile, slightly oblique, about 20 pairs, uppermost and lowest somewhat reduced, lowest few pairs more distantly spaced. *Middle pinnae* up to 17 cm. long

and 2·6 cm. wide, upper (anticous) base broadly cuneate or subtruncate, lower (posticous) base broadly rounded, sides very gradually tapering from near the base to near the apex, usually slightly constricted about 1·5–2 cm. from the acuminate, not caudate, apex; margins minutely sinuous; texture thin but firm, colour when dry medium brown-olivaceous above, paler beneath, costae castaneous above, paler beneath; veins slender, clearly raised on both surfaces when dry, at 70°–80° to the costa, about 13 per cm. *Fertile fronds*: stipe 10 cm. long, pinnae 22 pairs, upper and lower smaller, middle pinnae up to 13 cm. long by 6 mm. wide, sessile, base broad, gradually tapering towards the apex, apex shortly caudate (2 mm.), sterile. *Spores* thin-walled, shortly spiny.

Brazil. *Sellow*, s.n. (type, B.) (*Olfersia lanceolata* Klotzsch in scheda).

Sellow's travels were in S.E. Brazil, which is the territory of *L. erythrodes*. *L. lanceolata* differs clearly from that species in the shape of the sterile pinnae and in the narrow fertile pinnae. In addition to the type, there are two probable further specimens (at Kew and Cambridge), both labelled *Gardner* 101, Organ Mts. These specimens both consist of the upper part of a frond, and the pinnae have more cuneate bases than in the type; but the type itself, as commonly in this group of ferns, has the upper pinnae more cuneate than the lower. The spores of the Kew specimen appear to be smooth, but those of the Cambridge specimen are shortly spiny; the spines of spores of this type often seem to be rubbed off when old, and this may be the case here. Gardner's two specimens seem to be quite similar in other respects.

Lomariopsis speciosa *Holttum*, sp. nov.; *L. erythrodi* affinis, sed pinnis sterilibus angustioribus (usque 2 cm. latis), pinnis fertilibus angustioribus (usque 4 mm. latis), sporis laevibus differt.

Rhizome stout, densely covered towards apex with red-brown scales; scales about 1 cm. long and 1 mm. wide, the edges ciliate. Stipes 5–6 cm. long, red-brown; rachis red-brown, with narrow brown scales, not winged. *Sterile lamina* up to about 55 cm. long and 20 cm. wide; pinnae 15 pairs, oblique, sessile, about 3·5 cm. apart; pinnae towards apex much smaller than the middle pinnae, lowest pinnae somewhat smaller. *Middle pinnae* up to about 13 cm. long and 2 cm. wide, subequally cuneate at base (angle about 40° on each side), very gradually tapering from near base, apical third narrowed more rapidly to caudate apex; margins subdenticulate (projection at the end of each vein), caudate apex nearly entire; texture thin but firm, colour rather reddish when dry, especially rachis and costae above; veins slender, raised on both surfaces, at an angle of about 70° to the costa, about 12 per cm. *Fertile frond*: stipes up to 9 cm. long, pinnae 15 pairs, up to 9 cm. long and 4 mm. wide, on stalks 1 mm. long, base cuneate, apex shortly caudate. *Spores* not spiny.

Brazil. *Sellow* 370 (type, B.). (*Olfersia speciosa* Klotzsch in scheda). Bahia, *Luschnath* 86 p.p. (B). Bahia, ex herb. de Candolle (B. A young plant, not typical). Iguape, Peroapara, Estado São Paulo, *Brade* 8222 (N.Y.).

Brade's specimen quoted above matches the type closely. It was evidently collected at the same time and place as his no. 8223, which seems to me to be typical *L. erythrodes*, with broad pinnae and spiny spores. *Luschnath* 86 at Berlin consists of two specimens, one being *L. speciosa*, the other *L. erythrodes*; another indication that the two grow together. The difference is, however, so striking that I believe the two to be quite distinct.

The African Species.

With the exception of *L. Warneckei*, and an undescribed species from Uganda, represented by a solitary sterile specimen at Kew, all known species from the mainland of Africa are from the western side of the continent. These species are not so clearly divisible into groups as those of the American tropics. Three species (*L. decrescens*, *L. hederacea*, *L. Mannii*), have a very large number of pinnae, placed close together; the others have a much smaller number, usually broader and more widely spaced. As regards young plants, some members of this second group start life with simple fronds, and some with pinnate fronds; the adult plants do not show any clear distinctions corresponding with their young stages, and one species has a more or less intermediate young stage. Spore characters have proved helpful in distinguishing these African species. I recognise the following species:

1. **L. congoënsis** *Holttum*, sp. nov. (described below).
2. *L. decrescens* (Bak.) Kuhn in Verh. zool. bot. Ges. **19,** 571 (1869). *Acrostichum polyphyllum* Hook. Spec. Fil. **5,** 243 (1864) (not l.c. 269). *A. decrescens* Bak. in Hook. et Bak. Syn. Fil. 412 (1868).
3. *L. guineënsis* (Underw.) Alston in Journ. Bot. Suppl. 1934, 5. *Stenochlaena guineënsis* Underw. in Bull. Torr. Bot. Cl. **33,** 46 (1906). *Lomariopsis guineënsis* Kuhn, Fil. Afr. 53 (1868) (nom. nud.).
4. *L. hederacea* Alston in Journ. Bot. Suppl. 1934, 5.
5. *L. Mannii* (Underw.) Alston in Journ. Bot. Suppl. 1934, 6. *Stenochlaena Mannii* Underw. in Bull. Torr. Bot. Cl. **33,** 47 (1906).
6. **L. muriculata** *Holttum*, sp. nov. (described below).
7. **L. nigrescens** *Holttum*, sp. nov. (described below).
8. *L. palustris* (Hook.) Mett. ex Kuhn, Fil. Afr. 53 (1868). *Acrostichum palustris* Hook. Spec. Fil. **5,** 214 (1864).
9. **L. Rossii** *Holttum*, sp. nov. (described below).
10. *L. Warneckei* Hieron. in Engl. Jahrb. **46,** 383 (1911).

Note on L. guineënsis.

I have examined the type of this species in the Kew herbarium (fig. 6) and also a number of other specimens which I tentatively refer to this species. It is possible that some of these specimens may

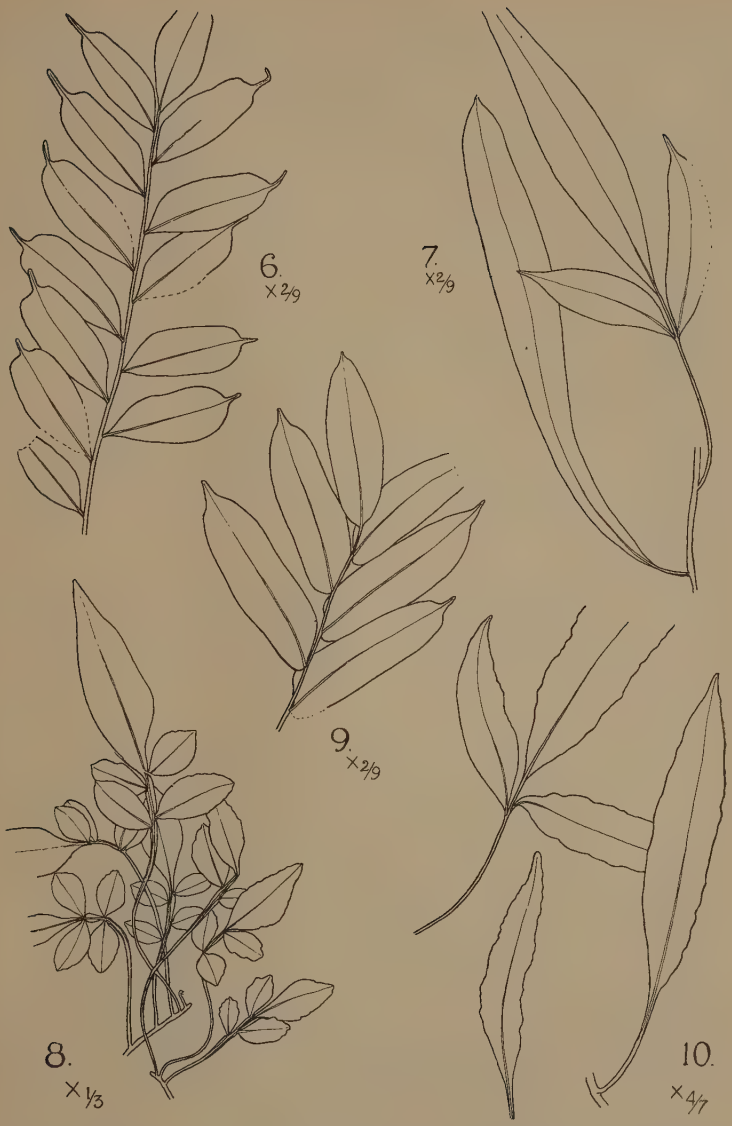
represent distinct but closely allied species, but with the material at my disposal I have been unable to see any clear distinctions, though specimens representing extremes of size appear very different from each other. In view of the fact that three other species are here described as new, a note on the essential characters of *L. guineënsis* seems necessary. These characters are as follows :— *Young plant* probably with simple fronds to a rather large size. *Rhizome scales* broad, dark, dull, not shining. *Sterile pinnae* : base narrowly cuneate (lower pinnae distinctly stalked), apex abruptly mucronate-caudate. *Fertile pinnae* short-stalked, base rather broad, apex caudate and sterile. *Spores* almost smooth, with few spines.

The characters of the young plant are not shown in the type collection, but have been seen in collections from the Belgian Congo (fig. 7). *L. palustris* agrees with *L. guineënsis* in its young stages, and also in its spore characters, but it never develops pinnate fronds.

Lomariopsis congoënsis *Holttum*, sp. nov. (figs. 8, 9) ; *L. guineënsi* affinis, sed frondibus plantae juvenilis pinnatis, rhizomate adulto paleis lucidis atro-rubris (fere nigris) vestito, pinnis sterilibus basi latioribus apice breviter subcaudatis, pinnis fertilibus latioribus (usque 1·2 cm. latis) usque ad apicem sporangiiferis, sporis perisporio convoluto munitis differt.

Scales of the rhizome dark, shining, up to almost 2 mm. wide, edges copiously brown-ciliate when young. *Stipes* of sterile fronds up to about 18 cm. long, pale brown, scaly at base ; rachis coloured as stipe, winged towards apex. *Sterile lamina* as much as 42 cm. long and 24 cm. wide ; pinnae up to about 10 pairs (type has 6 pairs), middle pinnae about 5 cm. apart, upper closer, lower more distant, up to 7 cm. apart), sub-basal largest, upper oblique, lower spreading, all sessile. Largest pinnae about 13 cm. long and 3·8 cm. wide, upper (anticous) base cuneate, rather less than 45°, lower (posticous) base rather narrowly rounded (more broadly on upper pinnae), sides subparallel for most of their length, edges undulate or crisped, rather suddenly contracted to a short subcaudate apex less than 1 cm. long ; texture thin but firm, colour olivaceous, slightly paler beneath, midribs medium brown ; veins slender, distinctly raised on both surfaces, concolorous with lamina, about 10 per cm., at about 70° to midrib. *Fertile pinnae* as much as 9 cm. long and 1·2 cm. wide, subsessile, base rather broad, apex gradually and almost evenly attenuate, entirely fertile, not caudate. *Spores* with copious folded perispore.

Portuguese Congo. Mayumbe, *Gossweiler* 8219 (type, B.M.). " Climbing on the trunks of forest trees ; spore-bearing fronds terminal. In wet situation near the village Caio—Hombe region—Rio Lufo, Maiombe. April 1919."



6. *L. guineënsis* (Type). Sterile frond. 7. ? *L. guineënsis* (*Reding* 36, Br.). Young plant. 8. *L. congoënsis* (*Vanderyst* 7525 Br.). Young plant. 9. *L. congoënsis* (Type). Sterile frond. 10. *L. muriculata* (*Vanderyst* 12113, Br.). Fronds from young plants.

Belgian Congo. Without locality, *Jespersen* 192 (Br.). Ipamu, *Vanderyst* 12097, 12308, 12114 (Br.). Kinsona, *Vanderyst* 6175 (Br.). Entre Ipamu et Kikiat, *Vanderyst* 9846 (Br.). Sankuru, Bena-Dibela territory, *J. M. Jensen* 62 (in herb. C. Christensen).

Young plants are represented in the Brussels herbarium. They are pinnate from a very young stage, with winged stipe and rachis. The earliest stage has a deeply lobed lamina (2 lobes on each side) 2·5 cm. long; the lobes are replaced by articulated pinnae in later fronds. A frond with a lamina 8 cm. long has 2 pairs of pinnae; a later frond with the lamina 13 cm. long has 5 pairs of pinnae, up to 3·5 cm. long and 1·7 cm. wide, the base as in the mature plant, the apex evenly narrowed and rather blunt; the apical pinna larger with the base decurrent into the wing of the rachis.

Specimens of young plants (all Br.). Région de Mjese (Nsele, Moyen Congo), *Vanderyst* 7525. Lukombe, *Vanderyst* 2678. Ipamu, *Vanderyst* 12062.

This species is distinct from *L. guineënsis* in its young plants and its spores; from *L. muriculata* it differs most strikingly in the broad dark shining scales; from *L. Rossii* it differs in scales, in broader fertile pinnae, and in sterile pinnae with short not caudate apex.

Lomariopsis muriculata *Holttum*, sp. nov. (fig. 10); *L. guineënsi* affinis, sed frondibus plantae juvenilis integris usque 8 cm. longis, majoribus pinnatis, rhizomate adulto paleis angustis vestito, pinnis sterilibus adultis basi latioribus, pinnis fertilibus petiolulatis apice obtusis usque ad apicem sporangiiferis, sporis perisporio convoluto munitis differt.

Rhizome clothed near apex with narrow dull brown scales, base shortly peltate, margins slightly ciliate, up to about 1 cm. long and less than 1 mm. wide; older parts of rhizome covered with small warts, the bases of fallen scales. *Stipes* of sterile fronds 10–15 cm. long, of fertile fronds 15–20 cm., dull brown, clothed towards base with scales like those on the rhizome. *Rachis* of same colour as stipe, glabrous when frond is fully expanded, not winged in adult plant. *Sterile lamina* up to about 65 cm. long and 25 cm. wide, pinnae up to about 12 pairs, about 3–4 cm. apart, oblique, upper and lower somewhat reduced, upper sessile, lower slightly stalked. Largest pinnae 15 cm. long and 4 cm. wide (pinnae of type up to 13 by 3·5 cm.), base subequally cuneate, each side at 45° or less to costa, the upper base often more remote from rachis than the lower; sides subparallel for most of the length of the pinna, apex usually rather abruptly mucronate, shortly subcaudate (up to 1·5 cm.), edges entire; texture thin but firm, colour dark brown above when dry, paler olivaceous beneath, midrib and veins brown; veins slender, distinctly raised on both surfaces, at about 70° to midrib, about 10 per cm. *Fertile* pinnae up to about 12 pairs, up to about 9 cm. long and 9 mm. wide, dark brown, venation distinct on upper surface, lowest pinnae with stalks about

3 mm., base narrowly cuneate, apex gradually attenuate, narrowly rounded, fertile throughout, without a sterile tip. *Spores* with copious perispore.

Belgian Congo. Youga, *Jespersen* 26 (type, Br.). Lisala, route de Gali, *Robyns* 1111, " forestière marécageuse, fougère arboricole à rhizomes s'accrochant par des crampons aux troncs " (Br.). Vaku, *Wellens* 351 (Herb. Mayombe), " Varenplant groeiend op boomen welke op vochtige plaatsen staan. De stengel, omslingerd heel den boom en is tot 6 meter lang." Entre la Lulue et la Luange, *Vanderyst* 12341. Région de Masla, *Vanderyst* 12577. Popo Kasongo, *Vanderyst* 17594. Yambuya, *Bequaert* 1306, " Forêt marécageuse ombragée."

Young plants are well represented in the Brussels herbarium. They have at first simple fronds, which attain a length of about 8 cm., with stipe 2·5 cm. ; width of lamina 1·7 cm. Later fronds have one pair of lateral pinnae about 5 cm. long by 1·3 cm. wide and stipe 7 cm. ; subsequent and larger fronds have progressively more lateral pinnae. The edges of laminae of young plants are somewhat crisped when dry, but have the pale cartilaginous margin characteristic of the genus. Such young plants are ascribed to the species by inference only, as there is no single collection showing all stages ; there are, however, a few collections showing intermediate stages, and I do not think I am wrong in ascribing the young plants to this species. They certainly do not belong to any other species here mentioned.

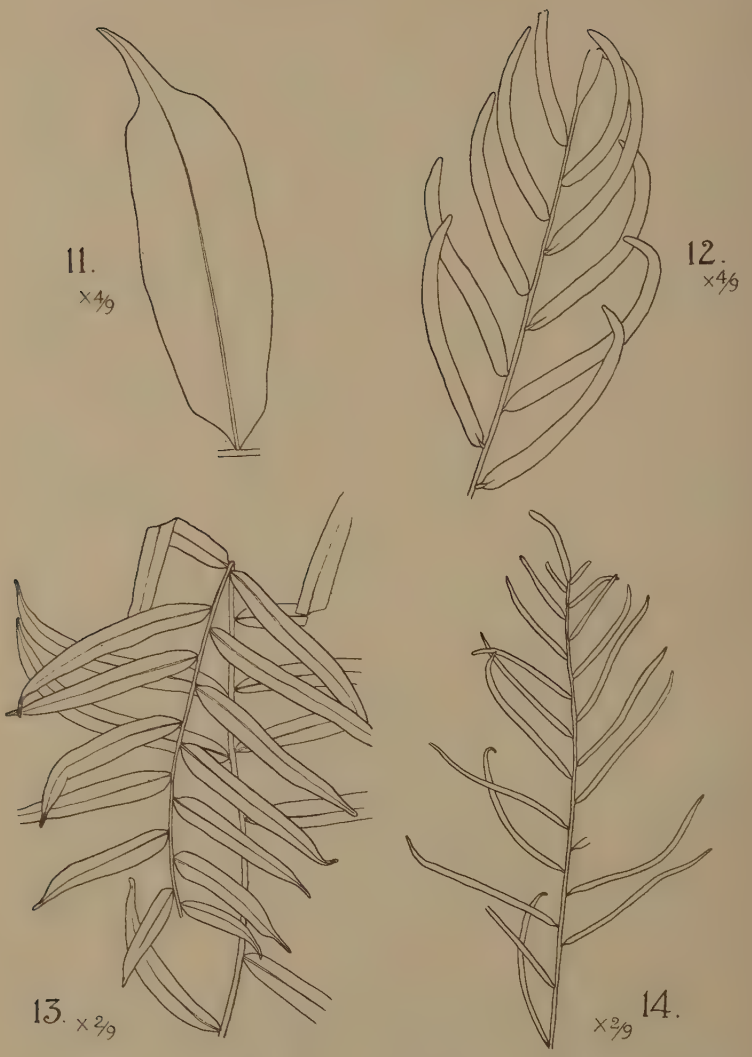
Specimens of young plants. Région des Bamfunuka, Bankana, *Vanderyst* 5478 (Br.). Ipamu, *Vanderyst* 12113, 12061a, b, c (Br.). (These specimens constitute a series, c being the youngest stage, a approaching *Robyns* 1111.)

The type which I have selected seems to me the single specimen best representative of the species, but, if I am right in including certain other specimens, the species may attain a size considerably larger than the type. The rugulose character of the rhizome after the fall of the scales is well shown by *Robyns* 1111, which is rather a small plant, showing a connexion with juvenile stages ; unfortunately the spores do not appear to be fully mature. It indicates that probably this species is fertile from a rather small size.

This species seems to me best characterized by its peculiar young stage, and by the long narrow rhizome scales which leave rather prominent warts when they fall.

Lomariopsis Rossii *Holttum*, sp. nov. (fig. 11, 12) ; *L. guineënsi* affinis, sed frondibus plantae juvenilis pinnatis, paleis plantae adultae pallidioribus, pinnis sterilibus basi late cuneatis apice minus abrupte contractis, pinnis fertilibus usque ad apicem non caudatum sporangiiferis, sporis perisporio convoluto munitis differt.

Rhizome clothed with light brown scales, their edges shortly ciliate when young, up to about 8 mm. long and 1·5 mm. wide. *Stipe* of sterile frond up to 15 cm. long, pale to medium brown, dull,



11. *L. Rossii* (Type). Middle sterile pinna. 12. *L. Rossii* (Type). Upper part of fertile frond. 13. *L. nigrescens* (Type). Sterile frond. 14. *L. nigrescens* (Type). Fertile frond.

scaly towards the base. *Sterile lamina* up to about 50 cm. long and 20 cm. wide ; pinnae about 10 pairs, about 4 cm. apart, oblique, subsessile, upper and lower slightly smaller than rest. Largest pinnae about 14 cm. long by 3·8 cm. wide, base cuneate at about 45° above, more widely cuneate or rounded below, both sides curving throughout, widest at middle, contracted to a subcaudate apex up to 2·5 cm. long ; edges entire or minutely sinuous ; texture thin but firm, colour when dry dark olivaceous above, slightly paler below ; veins slender, distinctly raised on both surfaces, at about 60° to costa, about 9 per cm. *Fertile pinnae* about 10 pairs, up to about 7 cm. long and 7 mm. wide, the upper ones subsessile, the lowest on stalks up to 3 mm. long, base rounded, apex gradually narrowed, bluntly rounded, fertile throughout. *Spores* with copious folded perispore.

NIGERIA. Cambridge Botanical Expedition 1935, Shasha Forest Reserve, Ijebu Province, Baba-Eku, swamp forest, on base of a tree trunk, *Ross* 22 (type, B.M.). Locality as type, *Ross* 235 (B.M.). Niger. Exp. 1857, *Barter* s.n. (K.). River Nun, *Barter* 20110 (K.).

FERNANDO PO. *Mann* 444, 374, and s.n. (K).

Mann's specimens at Kew show both young and adult plants. The youngest specimen has the rachis winged throughout, 7 pairs of pinnae, the largest 7 cm. long and 2·3 cm. wide. It is, thus, not representative of the earliest stage, but the winged rachis is usually associated with plants that are pinnate from the beginning.

Barter's unnumbered specimen includes a fertile frond ; his other collection, from River Nun (Niger delta) is sterile, and I am doubtful whether it should be referred here or to *L. muriculata*.

The fertile frond of the type yielded many translucent shrivelled spores as well as those with the folded perispore ; the former were presumably either immature or aborted.

Lomariopsis nigrescens *Holttum*, sp. nov. (figs. 13, 14).

Rhizoma ignotum. *Stipites* tenues, 12 cm. vel ultra longi ; paleae brunneae, lanceolatae. *Rhachis* glabrescens, atro-purpureus, apicem versus alatus. *Lamina sterilis* c. 60 cm. longa ; pinnae 14-jugae, leviter obliquae, superiores multo redactae, sessiles, infimae haud redactae, petiolulis 2 mm. longis munitae ; pinnae maximae c. 14 cm. longae, 1·5 cm. latae, basi subaequaliter cuneatae, acuminatae, apice per c. 1·5 cm. leviter contractae, margine minute irregulariter sinuosae, textura tenues, siccitate supra fere nigrae, subtus olivaceae ; venulae obliquae, tenues. *Pinnae fertiles* c. 14-jugae, superiores sensim redactae, sessiles, infimae petiolulis 3 mm. longis munitae ; maximae c. 11 cm. longae, 5 mm. latae, basi cuneatae, apice acuminatae.

FERNANDO PO. *Mann* s.n., received Feb. 1861 (type, K).

The narrow, oblique, rather distant pinnae of this species distinguish it clearly from all others from Africa that I have seen. The type is not a very good specimen, but I think it is quite adequate to characterize the species. In the Kew herbarium is also a specimen

collected on Barter's Niger Expedition, without locality, which perhaps represents a young stage of *L. nigrescens*. The rhizome is slender, stipes 14 cm. long, fronds 30 by 15 cm., about 9 pairs, up to 8 cm. by 1·3 cm. the base more rounded than in the type, colour blackish, rachis winged throughout.

Doubtful Specimens.

In the Brussels herbarium are three specimens from the Belgian Congo which have the same general appearance as the larger specimens referred to *L. guineënsis*, but one of them has spores with a folded perispore. They presumably represent an undescribed species, but without further material, including a better fertile frond, and young stages, the species cannot be adequately characterized. The specimens are as follows :

Belgian Congo. Li Kakola, *Jespersen* 139. Environs Lekada, *Robyns* 1326. Panzo, *Vanderyst* 5845.

LXIII—FRANÇOIS ETIENNE LE JUGE IN MAURITIUS.

René le Juge de Segrais.

[The following article is an English abstract of a French account by M. de Segrais of the work of his ancestor in Mauritius. It supplements in an interesting way the pamphlet by W. Edward Hart entitled " Le Jardin Botanique des Pamplemousses " (Imprimerie du Gouvernement, Port Louis, Île Maurice, 1916), an English abstract of which appeared in K.B. 1919, 279. In a letter M. de Segrais tells us that Mongoust was sold at the death of his uncle in 1913 and that the new owners pulled down the house, destroyed the rare plants, and planted the estate with sugar cane. The accompanying photographs, which were taken about fifty years ago, are therefore of special interest.]

On 26th October, 1746, François Etienne le Juge arrived as Counsellor to the Superior Council of the Île de France (Mauritius). He accompanied M. Barthélemy David, whose deputy he had been in the government of Senegal, on the appointment of the latter as Governor General of the Île de France and of Bourbon.

Le Juge had developed a great taste for botany in his youth at the magnificent park of Segrais,* where he had been brought up, but his father suffered financial losses, and in 1733, the estate having been sold, the young man had been obliged to seek employment. Through his family's interest in the India Company, he had been made Commandant of Gorée (Senegal) in 1734. He spent twelve years in Senegal, during which time he devoted his leisure to the introduction of fruit trees from Europe, and of a large number of plants which he obtained from America by the agency of slave-trading vessels.

When he arrived in the Île de France, then, the Counsellor already had a certain experience in tropical cultivation : he had

* A castle and estate in the parish of Saint-Sulpice-de-Favières, Department of Seine and Oise, about 25 miles from Paris.

Nephelium longana at Mongoust, planted before 1763. Photographed in 1880.

The old residence at Mongoust, photographed in 1880. Pulled down in 1913.

also his own method* for importing plants from distant countries, i.e., for their preservation during long sea journeys, their acclimatization, and their propagation. No sooner had he reached the island than he resolved to form a garden for the acclimatization of all plants which he could get from Europe and elsewhere, so that they might be propagated for the general benefit of the Colony. On the 28th March, 1748, he wrote as follows to the Directors of the Company :

" My establishment† has obliged me to buy a property for £6,000. As the soil is good, I mean to form there a garden, in which I propose to collect not only the fruits and vegetables of the country, but also such trees and plants as I can obtain from elsewhere. I have no doubt that many European fruit trees will flourish wonderfully there, and this emboldens me to ask you, gentlemen, to send me the trees shown on the accompanying list, which comprises those which I think will succeed best. It is not at all my own interest which prompts this request, but the general welfare of the Island, where these trees, being multiplied, will bring great benefit. I know that you have already sent many trees, and I also know, after careful investigation, that they have perished through carelessness, and that that is the only reason why not one of these trees has succeeded. I promise you, gentlemen, that those which you may send to me will be better cultivated. I have grown many

* The following is a description of le Juge's method in his own words : One must have a wooden box, a foot longer than the plants which one is going to put in it, 2 feet deep and as wide as is required for the number of trees. You begin by putting 5 or 6 inches of soil to form a bed in the bottom of the box. This earth must be good and light, free from stones and pebbles. Black, sandy earth is very suitable. It must be in its natural state of humidity and not at all dry. On this bed of soil one lays the plants at full length, after having topped them if they are rather large or without cutting them at all if they are no larger than quills, but one must clip them if they are too long for the box. One damps the roots, trimming and cutting those which are too long as one does when transplanting trees. In a box such as I have described and 2 feet wide, one could put 25 to 30 stumps of trees, i.e., according to the size of the roots, which occupy the greatest space. That is why one must arrange them with the roots facing outwards at either end of the box. When all the plants have been put into the case on top of one another in this way, one begins to put more soil into the box over the trees, sprinkling it with the hands so that all the intervals between the trees and the roots are completely filled. After which, one covers the whole thing with a mass of soil to the depth of 4 or 5 inches. It is most important not to fill the box completely with soil. One must, on the contrary, leave a space of 2 or 3 inches so that air can enter, and to ensure this, one pierces several holes in different parts of the lid. It only remains to nail up the top and put it on board immediately, taking care not to put it in the hold where the great heat and the lack of air would cause the trees to perish, but in an airy place and away from draughts. There will be no need to touch it during the whole journey, even if it lasts for six months or more. It is certain that the trees will arrive fresh and in a good state for transplanting, much better than in open tins or pans.

† He had married Mlle. de Bouloc the previous year.

kinds of fruits in the sand of Senegal, which one would not think capable of producing the least thing : there had not been one of them in that part of the concession before I came there, and, therefore, I think that I shall succeed still better in the soil of this island, which is extremely fertile."

The property, which he named Mongoust, was in the district of Pamplemousses, hardly two kilometres from Monplaisir. The Counsellor set to work ; he obtained trees and plants of every kind from the four quarters of the globe ; he had correspondents in China, in the Straits of Malacca, in India, Madagascar, Mozambique, Brazil, and Senegal. In 1763, he had planted nearly 800 trees, in about 50 species, most of which were adult, and many bearing or about to come into bearing. Of particular importance were 300 mangoes in ten or twelve different kinds, breadfruit, litchis, *longaniers* [*Nephelium longana* Cambess.], avocadoes, etc. Note that it was he who introduced the cacao*, avocado, custard-apple, Opuntia, the *colatier* [*Cola acuminata* Schott and Endl.], several kinds of mangoes, and the famous " *bambous pleins* " [=*bambous nains*, *Bambusa multiplex* (Lour.) Raeusch] used throughout the colony at the present day for hedges round the houses, which he obtained from the Straits of Malacca. On the 20th November of this year (1763) he sent to the Company a detailed list of all the plants collected in his garden at Mongoust, classified by country of origin, with notes on their acquisition, their cultivation, growth, production, and on the quality and utilisation of their fruits.

Le Juge had these plants distributed throughout the island, but he took care to observe the localities in which particular species succeeded best, and to increase the distribution in those areas.

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* According to Adrien d'Epinay, Cossigny de Palma had, since 1760, brought some cacao pods which he had gathered from Manilla trees in the garden of Oulgaret, near Pondicherry ; but he adds that the planting of seeds by M. Aublet gave no result, and that consequently Cossigny procured some plants which succeeded well at Palma. It is likely that these plants came from Mongoust, for in 1763 the Counsellor stated that the one and only plant in the two islands was in his garden, and—a curious point—he had almost lost it through fire.

The cacao cultivated in the King's garden some years later with a view to propagation was introduced to Bourbon about 1780, and the first plantation in that island was that of M. Hubert, who had 40,000 plants by the beginning of 1786 ; M. de Céré specially mentions this in his report for 1785.

With regard to plants whose introduction is due to François Etienne le Juge, M. Elie Pajot, badly informed on the matter, and quite wrongly, in his book " Simples renseignements sur l'Île Bourbon " (Paris, Challamel, 1887) is pleased to dispute the merits of the Counsellor. Basing his argument on a letter from the latter, dated 1754, thanking M. Lagourgue, an inhabitant of Bourbon, for having obtained for him a plant of Mangosteen, M. Pajot tries to show that it was from Bourbon that this tree came to the Île de France. Now, there is no doubt that, from one cause or another, the plant sent by M. Lagourgue failed to grow, for in his catalogue of 1763 Le Juge shows that the eight plants of Mangosteen in his garden were only two years old and that they came from Batavia.

He managed, without any doubt, the garden of Réduit, when David took up residence there. The Governor naturally made use of his capability and devotion, having seen his work in Senegal and being attached to him by a friendship of long standing. Further, after David had left, the Counsellor continued to take a particular interest in the progress of the plants at Réduit ; he speaks of them frequently in his " catalogue," while he makes no mention of Monplaisir, which makes one think that at that time this garden was abandoned.

Le Juge died at Port-Louis on 28th January, 1766, at the age of 56.

The Royal Garden of Monplaisir was first formed by La Bourdonnais, but it was Poivre who revived it, developed it on a scientific basis, and who was its real creator. His disciple Céré continued his work, and these two men deserve most of the credit for the garden [see K.B. 1919, 279]. Le Juge did not collaborate with them, for he died a year before Poivre arrived in the Colony, but the Mongoust Orchards were in full bearing at this time, and a great number of the trees and plants which formed the beginnings of the reconstituted garden of Monplaisir came from Mongoust and Réduit.

In addition to being the pioneer, therefore, Le Juge did in a manner share in the creation of the chef d'oeuvre, since he provided a part of the material from which it was formed. His scientific knowledge was only equalled by his modesty ; his work has passed quite unnoticed except for a brief mention in Bernardin de Saint-Pierre's " Voyage à l'Isle de France." His name appears on the Liénard Column, an obelisk of marble erected in 1860, on which are inscribed the names of benefactors of the Colony.

LXIV—NOTES ON THE VEGETATION OF THE NIGERIAN SHORE OF LAKE CHAD.

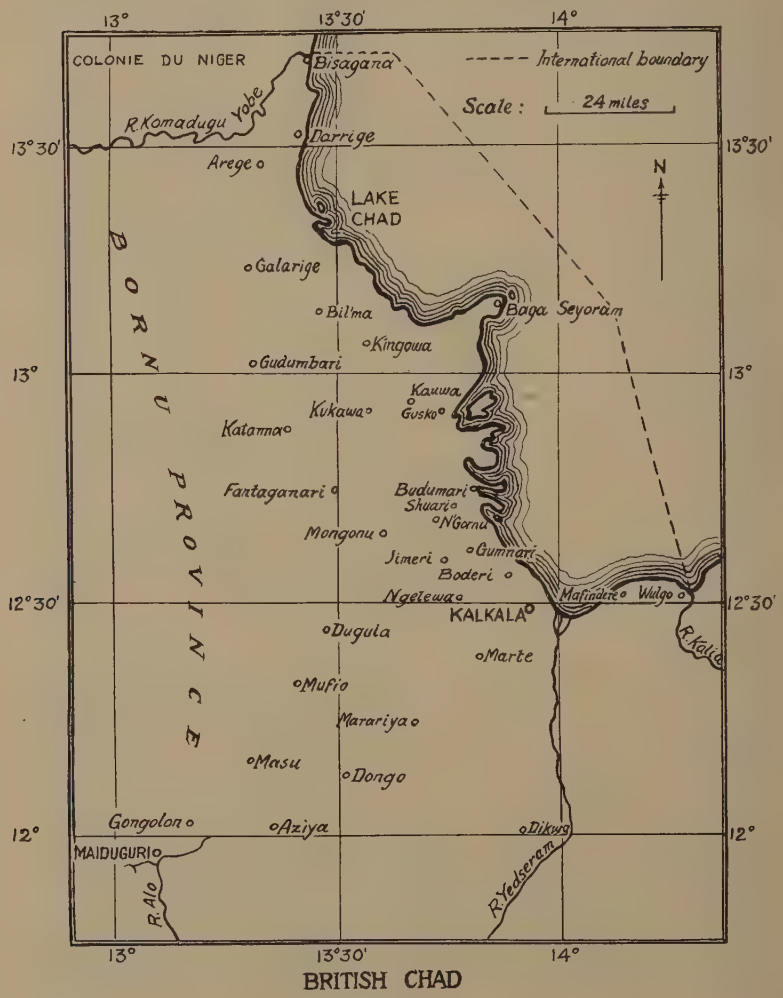
F. D. Golding and A. M. Gwynn. (The Department of Agriculture, Nigeria.)

Introduction.

Approximately 130 miles of the shore of Lake Chad lie in British territory (see map p. 632) ; of these the most southerly eight miles are situated in mandated Cameroons (administered as the Dikwa Division of the Bornu Province) and the remainder are in the Bornu Emirate.

In recent years the Chad area has been regarded as being a possible outbreak centre of two species of locusts, and the data described below were accumulated during four periods of locust research between 1931 and 1934. An ecological survey was made of the 12 square miles of territory surrounding Kalkala, a village at the south-western corner of the lake, and reconnaissances were carried out along the shore to Bisagana in the north and to Wulgo in the east. Of 17 months spent in the Chad area, about 12 were devoted to the ecological survey and 5 to reconnaissance.

Both species of locusts were found either in grass or farmland habitats and, for that reason, particular attention was paid to grasses, sedges and the weeds occurring on old farmland. Except in the immediate vicinity of villages in 1933, the Kalkala survey area contained only seven trees exceeding fifteen feet in height and most of these have since been killed by the extensive flooding of the lake in 1935 and 1936. The majority of trees in the area under review belong to the genera *Acacia, Ziziphus* and *Bauhinia.*



Month and year.	Average max. temp. in shade ° Fahr.	Average min. temp. in shade ° Fahr.	Absolute max. temp. in shade ° Fahr.	Absolute min. temp. in shade ° Fahr.	Average relative humidity. 9 a.m. %	Average relative humidity. 3 p.m. %	Rainfall in inches.	No. of days on which rain fell.
1933.								
Jan.	87·2	59·4	96·8	53·4	49	38	0	0
Feb.	92·5	57·7	108·4	48·0	41	34	0	0
March	99·5	65·3	115·0	60·2	39	34	0	0
Apr.	108·7	70·5	116·0	60·4	42	38	0·06	1
May	105·3	72·1	114·0	62·0	48	40	2·405	7
June	101·1	74·6	111·8	68·0	62	46·5	1·37	7
Sept. (9th–30th) ...	96·1	73·4	100·5	65·0	69	49	2·79	3
Oct.	97·4	66·5	102·5	60·0	39	30	0	0
Nov.	99·9	63·3	103·0	57·5	36·5	34	0	0
Dec.	—	61·1	—	49·5	39	30·5	0	0
1934.								
Jan. (1st–21st) ...	—	57·0	—	53·0	38	29	0	0
May (24th–31st) ...	—	—	—	—	—	—	3·43	3
June	97·3	72·7	105·5	69·0	63	47	1·71	7
July	94·6	72·7	104·5	69·5	72	51	7·03	12
Aug.	90·3	72·1	96·0	68·5	81	67	6·10	15
Sept.	94·8	72·6	101·0	69·0	72	53	1·80	5
Oct. (1st–16th) ...	100·6	70·5	105·5	62·5	54	36	0·29	1

Table of meteorological data from the station at Kalkala.

The present paper gives an account of the littoral vegetation at various points along the lake and some notes on the farming methods of the Kalkala villagers, the majority of whom are Shuwa Arabs and the remainder Kanuri.

Climate.

The climate is of the semi-arid type, in which the total rainfall occurs during rather less than six months of the year. Our records indicate that at Kalkala the climate is very similar to that of Maiduguri, a station about 70 miles to the south-west, although the annual rainfall is slightly lower. There is sometimes a shower of rain in April, but the real wet weather does not begin until after the middle of May. The wet season ends with the onset of the arid north-easterly "harmattan" wind in late September or October; this is accompanied by an abrupt fall in atmospheric humidity (see table p. 633). From May to September the prevailing wind is south-west and from October to April it is north-east.

A meteorological station was opened at Kalkala on 1st January, 1933. Records are available for the following periods: 1st Jan. to 30th June, 9th Sept. to 31st Dec. in 1933; 1st Jan. to 21st Jan., 24th May to 16th Oct. in 1934. Maximum and minimum shade temperatures, relative humidity and rainfall are shown in the table on page 633.

Rainfall records for a complete year are not available. In 1934 the precipitation from 24th May to 16th October was 20·36 inches, and it is very improbable that the total rainfall for that year exceeded 21·50 inches. Except for the period 4th to 17th June, records were taken throughout 1932 at Mongonu, a village about 13 miles west of Lake Chad; 19·94 inches of rain fell during the 50 weeks.

Annual Flooding of Lake Chad.

Each autumn the lake rises and floods large areas to the south and south-west. The northerly section of the shore is protected by ranges of sandhills from 200 yards to 3 or 4 miles from the low water edge of Chad. The borders of the lake are very inconstant, varying not only with the time of year, but also from year to year, depending on the rainfall in the areas which drain into Chad. The extent of the annual flood is also influenced by the strength of the "harmattan." Thus, after a series of wet years the dry-season floods tend to be very extensive and even the low water margin may advance considerably; while after a series of very dry years large areas of the lake may dry up completely (1). It is of interest that the floods have been successively greater each autumn from 1933 to 1936. In 1935, Kalkala was inundated and a new village was built a mile farther inland. In February 1937, eleven of the twelve square miles of the survey area were still under water and the new village was on an island.

Flooding begins in September and reaches its maximum soon after mid-December. During periods of strong "harmattan" the

inundations advance rapidly and then recede when the intensity of the north-easterly wind decreases. The rise and fall of the flood waters at Kalkala were measured between September 1933 and January 1934. The level was constant from 10th to 25th September ; there was a rise of 3 inches from the 26th to the 30th, followed by rises of 15 inches in October, 9 inches in November and 8 inches between 1st and 23rd December. It will be seen that the total rise was 35 inches in just under three months. Between 24th December and 27th January there was a fall of $11\frac{1}{2}$ inches. In 1932, the recession of the flood water began a few days before 21st December.

In the littoral area between Gusko and Kalkala there are a number of depressions leading inland from the low water edge of the lake. In years of exceptionally high water the inundations extend for as far as eight miles along certain of the depressions. Sandy areas with an elevation several feet higher than that of the depressions are often entirely surrounded by water from November to March or April. Between Kalkala and Mafindere there are channels which form the delta of the river Yedseram, which flows for only a few months of the year ; the first water comes down the river in August.

The Littoral Vegetation.

During the period when the writers were engaged in locust research (1931 to 1934) in the Chad area the littoral vegetation in the southern section of the shore consisted of well-marked zones running parallel to the shore line. These zones were remarkable in that each was usually dominated by a single characteristic species of grass, often to the almost complete exclusion of any other species. The heavy floods of 1935 and 1936 showed that these zones must be regarded as being inconstant and subject to fluctuation. The bordering zones of vegetation ebb and flow in accordance with variations in the level of the lake. Thus after a series of high water years the hygrophilous zones tend to advance inland and, after a series of dry years, the reverse takes place. In 1933, a map was made (2) showing the distribution of the various species of grasses and other plants in the survey area at that time ; an examination of the area after the heavy floods of 1935 and 1936 produced evidence that the advance of hygrophilous species had been very considerable.

The low water level of Lake Chad (in years of inextensive flooding) is fringed by a belt of *Cyperus Papyrus* Linn. In the northern part of the shore this belt varies in width from about five to forty yards and is bounded on its eastern side by open water, dotted here and there with papyrus islands. The south-western part of Chad is almost entirely covered with dense vegetation and there is very little open water. Large areas of *C. Papyrus* were seen near Kalkala, Mafindere and at the mouth of the Kalia river near Wulgo.

The constituents of the vegetative zones and the approximate width of each belt at three points on the northern shore (in 1931) are recorded below.

(a) *Bisagana, 24th October.*

Open water followed by 5 to 30 yards of *Cyperus Papyrus*—50 yards of *Echinochloa pyramidalis* Hitchc. et Chase—120 yards *Peristrophe bicalyculata* (Retz.) Nees and farmland—50 yards *Acacia spp.—Peristrophe bicalyculata, Pennisetum pedicellatum* Trin. and *Cenchrus biflorus* Roxb.

(b) *Darrige, 22nd October.*

Open water followed by 40 yards of *Cyperus Papyrus*—160 yards of ? *Phragmites communis* Trin.—40 yards of *Echinochloa pyramidalis, Cyperus articulatus* Linn. and a little *Phragmites* sp.—250 yards of *Cynodon Dactylon* Pers., *Sporobolus spicatus* Kunth, *Pennisetum pedicellatum, Acacia* spp. and *Cenchrus biflorus.*

(c) *East of Arege, 23rd October.*

Open water followed by *Cyperus Papyrus* and ? *Phragmites communis* belts—60 yards *Echinochloa pyramidalis* and a little *Phragmites* sp.—50 yards *Sporobolus spicatus* and old farmland—50 yards dense trees, mostly *Acacia*—a slight rise covered with *Cenchrus biflorus.*

The first three belts at Darrige and the first two at Arege were under water.

The shore line to the south of Baga Seyoram is less clearly defined and is characterised by large depressions running inland.

The vegetation in the ecological survey area at Kalkala was studied in some detail and has been described at length elsewhere (2). In this area, the water is at the low-water level for only two or three months in the year. The hygrophilous grasses, *Vossia cuspidata* Griff. and *Echinochloa pyramidalis* occupy the zone on the inland side of the papyrus belt ; clumps of *Herminiera elaphroxylon* Guill. & Perr. are not uncommon, but the trees are seldom more than about six feet in height in British Chad. This marsh-grass zone is followed by a plain of *Cynodon Dactylon* which is often about 400 yards in width. In some places there is a narrow belt of *Brachiaria ramosa* Stapf between the marsh-grass and the *Cynodon* ; *Brachiaria* is particularly abundant in the Yedseram delta region and extends inland along the watercourses. Patches of the sedges *Cyperus articulatus* and *C. dives* Del. occurred in the lower part of the *Cynodon* belt ; during the time when the floods have receded to the *Vossia* the Arab women dig up the roots of *C. articulatus,* which, when placed on a fire, give off an odour repellent to mosquitoes. At high water the network of flooded channels surround sandy islands covered with *Cymbopogon giganteus* Chiov. To the north of Kalkala there is a large sandy peninsula covered with *Cymbopogon* which adjoins the *Cynodon* belt.

In years of normal flood the high water mark is at the inland edge of the *Cynodon* ; in places there is a belt of both grasses and, if the inundations are greater than usual, the *Cynodon* advances farther inland and the flooded *Cymbopogon* dies. Patches of *Chloris Gayana* Kunth occur at the edge of the *Cymbopogon* peninsula, and farther out in the channels there are areas of *Brachiaria ramosa*. Excessive flooding leads to the replacement of *Chloris* by *Brachiaria*. Similarly the sedges replace *Cynodon* and, nearer the lake, *Echinochloa* replaces *Brachiaria*. In February, 1937, eleven of the twelve square miles of the survey area were still under water, the *Cymbopogon* peninsula had become a comparatively small island and the changes in vegetation generally were very great. The former *Cynodon* belt was covered with *Cyperus articulatus*, *Brachiaria* and *Echinochloa* or with open water, beneath which could be seen apparently dead plants of *Cynodon*. Much of the *Cymbopogon* appeared to have been killed and will probably be replaced by *Cynodon*.

Before describing the vegetation of the farmland areas, not normally subjected to flooding, it is necessary to mention the dicotyledonous species which occur in the grass habitats. The *Echinochloa* and *Brachiaria* belts contain small patches of *Herminiera elaphroxylon* ; *Lippia nodiflora* Rich. is occasionally seen in *Cynodon* areas, while the *Chloris* patches consist solely of that grass. The sandy *Cymbopogon* areas contain patches of *Pavonia hirsuta* Guill. et Perr., *Indigofera pulchra* Willd., *Calotropis procera* Ait., and a few stunted *Acacia* and *Ziziphus*. The old groundnut farms in the belt are populated with many of the annual weeds found on the inland cultivated areas.

In the inland farmed areas, not subject to annual flooding in normal years, patches of *Peristrophe bicalyculata* cover fallow land along the high water mark. The most common weeds of old farmland are *Pulicaria undulata* DC., *Corchorus tridens*, Linn. ; *Brachiaria lata* C. E. Hubbard ; *Trichodesma africana* (Linn.) R. Br. ; *Heliotropium undulatum* Vahl ; *Aerva persica* (Burm.) Merrill ; *Farsetia ramosissima* Hochst. var. *macrocarpa* Schweinf., and *Leucas martinicensis* R.Br. In addition to the above species the following were collected in January, 1933, on old farmland :

Polycarpaea corymbosa Lam. ; *Trianthema pentandra* Linn. ; *Celosia laxa* Sch. et Thonn. ; *Amaranthus Blitum* Linn. ; *Abutilon muticum* (Del.) Webb ; *Euphorbia scordifolia* Jacq. ; *E. convolvuloides* Hochst. ex Boiss. ; *Cassia Aschrek* Forsk. ; *Indigofera oblongifolia* Forsk. ; *Crotalaria arenaria* Benth. ; *Leptadenia lancifolia* Decne. ; *Mitracarpum verticillatum* Vatke ; *Vicoa auriculata* Cass. ; *Pegolettia senegalensis* Cass. ; *Dicoma tomentosa* Cass. ; *Centaurea senegalensis* DC. ; *Lactuca taraxacifolia* Thonn. ; *Heliotropium zeylanicum* Lam. ; *Physalis angulata* Linn. ; *Solanum incanum* Linn. and *Jacquemontia capitata* G. Don.

Scattered plants of *Calotropis procera* Ait. occurred in this area.

The following four species of *Papilionaceae* were found in habitats subject to flooding ; they flowered at the end of the rains and died early in the dry season : *Indigofera secundiflora* Poir. ; *Crotalaria goreensis* Guill. et Perr. ; *C. intermedia* Kotschy and *C. sphaerocarpa* Perr. ex DC. *Hibiscus asper* Hook. f. occurred near the limit of the floods.

Clumps of Bulrush (? *Typha australis* Schum. et Thonn.) were observed in very heavy soil in the middle of a depression which was flooded in the dry season. *Sorghum aethiopicum* Rupr. ex Stapf is a very common grass in farmland subject to annual flooding and it occurs in vast belts in the " black cotton soil " of northern Dikwa and in various localities between Gusko and Kalkala.

Notes on Agricultural Practice at Kalkala.

Agricultural practice at Kalkala is largely influenced by the autumn flooding of Lake Chad. As will be seen from the succeeding paragraphs, the system of cropping is altered in years when the recession of the inundations is later than usual. The incoming flood waters are controlled by means of mud dykes across the narrowest parts of the depression (to the north-west of the village) along which Chad advances to flood the inland farmland. The dykes are kept in position until the Maize harvest is completed ; after that the dykes are opened and the flood waters are used for irrigating the dry season Guinea Corn. The local fishermen subsequently build or renovate dykes and catch large quantities of fish in mud-walled traps when the waters recede.

Dry season Guinea Corn or " mazakwa."—This crop has been identified at the Royal Botanic Gardens, Kew, as being intermediate between *Sorghum caudatum* Stapf var. *Feterita* Stapf and *Sorghum Durra* Stapf var. *niloticum* (Koern.) Snowden.

Seed-beds are prepared near the village in the first half of August. The seedlings are transplanted between early September and mid-October into land which is not subject to flooding later in the year or which is protected by dykes. In the latter case, irrigating channels are cut and the supply of water in the dyke-protected area is controlled ; the water is kept off the fields until about three weeks before harvesting begins.

Harvesting takes place between mid-December and mid-January and is preceded by some weeks of bird-scaring. This is carried out by people who spend the entire day on raised platforms in the fields ; frequently one scarer can cover a large area by means of ropes to which are attached pieces of calabashes. The " mazakwa " is stooked and the tops of the stooks are covered with weeds to protect the grain from birds, of which the Niger Mourning Dove and the Red-billed Dioch are the worst offenders. In 1932, the grain smut, *Sphacelotheca Sorghi* (Lk.) Clinton, was common in fields where the " mazakwa " was standing in water and Witchweed, *Striga senegalensis* Benth., was prevalent in localised areas.

Several other varieties of *Sorghum* are grown. In March, 1933, small areas of land from which the floods had recently receded were planted with *Sorghum* sp. In the second half of September, 1934, guinea corn was harvested; the plants were two to three feet high in early June. *Sorghum nigricans* Snowden var. *peruvianum* and *S. caudatum* Stapf var. *gibbum* Stapf were collected by the writers from the Chad area.

Maize.—In 1933 maize sowing was begun on 29th June in heavy soil (37 per cent. silt and clay) subject to inundation later in the year. In 1934, sowing took place between 13th and 20th July, following a break in the rains of four weeks duration, which ended on 12th July. Harvesting is carried out between mid-September and the end of October. In recent years the crop has been severely damaged by the African Migratory Locust.

Bulrush Millet or "gero."—Pennisetum typhoides (Burm.) Stapf et Hubbard is sown after the first rains in May on land not subject to inundation (21 per cent. silt and clay). A week or two before the harvest the plants are trampled down with the object of protecting the seedheads from attack by birds and locusts. Harvesting begins in early September and ends in early October.

A dwarf variety known as "ligi" is sown in years when the floods are late in receding. It is sown in the very heavy clay soil as the water recedes (probably in February and early March) and it is harvested between mid-May and mid-June.

Cowpeas (*Vigna unguiculata* (Linn.) Walp.)—Cowpeas are sown in the very heavy clay soil as the water gradually recedes; sowing begins in mid-December and ends in mid-March. There are four varieties which are sown in succession and always in the same order. In 1933, the first flowers appeared on the earliest-sown variety on 1st March and, by the 26th of March, some pods were ready for picking. The harvest ended in mid-June and the haulms were then brought to the village and used as fodder. In 1933, no "ligi" was sown, but in the following year a considerable area of this millet was planted below the Cowpeas because, owing to the lateness of the recession of the floods, there was not time for late-sown Cowpeas to mature before the beginning of the rains. The young pods were attacked by the larvae of the Noctuid moth, *Prodenia litura* F., and of a Lycamid butterfly (probably *Euchrysops malathana* Bdv.).

Groundnuts (*Arachis hypogaea* Linn.).—This crop is sown in June on sandy soil (10 per cent. silt and clay) and on heavier land not subject to inundation. Groundnuts are sometimes sown through Bulrush Millet; harvesting takes place in early October.

Cotton.—A perennial Cotton is grown in the sandy soil; the area is increased by sowing strips of land at the edge of the field. Young seedlings, spaced from three to five feet apart, were seen in October. All the lint is used locally.

Strips of Cotton are sown in February in the Cowpea land with the object of demarcating the various plots belonging to different farmers.

Wheat.—Most of the wheat is grown by the side of a large pond. The field is divided into beds with raised irrigation channels between them and the water is raised by means of shadoof. Sowing takes place between mid-December and the end of January, and harvesting from mid-March to mid-April.

Other Crops.—A gourd-like plant ("bambusu," *Citrullus vulgaris* Schrad.) is sown in March in the centre of the area formerly flooded. Holes are made in the very stiff clay and a little sand is put in each hole before the seeds are sown. The crop ripens in May and the first part of June; the fruits have a peculiar but pleasant taste and are picked by the Arabs as required.

Tobacco, onions, *Hibiscus esculentus* Linn., *Indigofera* and calabashes are also grown.

A complete list of the plants collected by the writers in Bornu will be found in the appendix.

In conclusion, the writers wish to acknowledge their indebtedness to the Director and staff of the Royal Botanic Gardens for identifying the plant specimens; to Messrs. H. C. Doyne and W. A. Watson for analysing soils and to Mr. J. West for identifying the smut on "mazakwa."

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APPENDIX

LIST OF PLANTS COLLECTED IN BORNU BY F. D. GOLDING AND A. M. GWYNN.

(After each species the author's collecting number, locality, and month of collection are given, in that order.)

CRUCIFERAE

Farsetia ramosissima Hochst. var. *macrocarpa* Schweinf. (70, Kalkala, Jan.).

CARYOPHYLLACEAE

Polycarpaea corymbosa Lam. (58, Kalkala, Jan.).

FICOIDACEAE

Trianthema pentandra Linn. (44, Kalkala, Jan.).

AMARANTACEAE

Amaranthus Blitum Linn. (48, Kalkala, Jan.). *Celosia laxa* Sch. et Thonn. (61, Kalkala, Jan.). *Aerva persica* (Burm.) Merrill (56, Kalkala, Jan.).

TILLIACEAE

Corchorus tridens Linn. (133, 134, Kalkala).

MALVACEAE

Abutilon muticum (Del.) Webb (64, Kalkala, Jan.). *Pavonia hirsuta* Guill. et Perr. (25, 97, Bisagana, Baga Seyoram, Oct., Kalkala). *Hibiscus asper* Hook. f. (93, Kalkala).

EUPHORBIACEAE

Euphorbia scordifolia Jacq. (74, Kalkala, Jan.). *E. convolvuloides* Hochst. ex Boiss. (65, Kalkala, Jan.).

CAESALPINIACEAE

Cassia Aschrek Forsk. (62, Kalkala, Jan.).

PAPILIONACEAE

Indigofera secundiflora Poir. (90, Kalkala, May–Sept.). *I. pulchra* Willd. (137, Kalkala). *I. oblongifolia* Forsk. (63, Kalkala Jan.). *Crotalaria goreënsis* Guill. et Perr. (88, Kalkala, May–Sept.). *C. intermedia* Kotschy (89, Kalkala, May–Sept.). *C. sphaerocarpa* Perr. ex DC. (87, Kalkala, May–Sept.). *C. arenaria* Benth. (51, Kalkala, Jan.). *Herminiera elaphroxylon* Guill. et Perr. (91, Kalkala). *Alysicarpus glumaceus* (Vahl) DC. (96, Kalkala).

ASCLEPIADACEAE

Leptadenia lancifolia Decne. (45, Kalkala, Jan.).

RUBIACEAE

Mitracarpum verticillatum Vatke (54, Kalkala, Jan.).

COMPOSITAE

Pulicaria undulata DC. (57, Kalkala, Jan.). *Vicoa auriculata* Cass. (60, Kalkala, Jan.). *Pegolettia senegalensis* Cass. (68, Kalkala, Jan.). *Dicoma tomentosa* Cass. (75, Kalkala, Jan.). *Centaurea senegalensis* DC. (71, Kalkala, Jan.). *Lactuca taraxacifolia* Thonn. (136, 59, Kalkala, Jan.).

BORAGINACEAE

Heliotropium zeylanicum Lam. (43, Kalkala, Jan.). *H. undulatum* Vahl (98, 99, 47, Kalkala, Jan.). *Trichodesma africanum* (Linn.) R. Br. (100, 46, Kalkala, Jan.).

SOLANACEAE

Physalis angulata Linn. (53, Kalkala, Jan.). *Solanum incanum* Linn. (52, Kalkala, Jan.).

CONVOLVULACEAE

Jacquemontia capitata G. Don (95, 49, Kalkala, Jan.).

VERBENACEAE

Lippia nodiflora Rich. (101, 24, Baga Seyoram, Oct., Kalkala).

LABIATAE

Leucas martinicensis R. Br. (94, 50, Kalkala, Jan.).

CYPERACEAE

Scirpus supinus Linn. (30, Galarige, Oct.). *Fimbristylis exilis* Roem. et Schult. (17, Kauwa, Oct., Baga Seyoram, Oct.). *Cyperus*

dives Del. (81, Kalkala, May). *C. bulbosus* Vahl (14B, Kauwa, Shuari, Marte, Mongonu, Kalkala, Oct. and Nov.). *C. Zollingeri* Steud. (79, Kalkala, May). *C. sphacelatus* Rottb. (116, 135, Ngala, Oct., Kalkala). *C. esculentus* Linn. (14A, Galarige, Oct.). *C. articulatus* Linn. (83, 35, Bisagana, Darrige, Arege, Oct., Kalkala, May). *C. Papyrus* Linn. (23, Bisagana, Darrige, Arege, Baga Seyoram, all Oct.). *Pycreus Mundtii* Nees (112, Baga Seyoram, Dec.).

GRAMINEAE

Eragrostis ciliaris (Linn.) R.Br. (16, Kauwa, Gusko, both Oct.). *E. diplachnoides* Steud. (39, Marte, Nov.). *E. aegyptiaca* Del. (132, Kalkala). *E. biformis* (Kunth) Benth. (110, Baga Seyoram, Dec.). *E. tremula* Hochst. ex Steud. (3, Mongonu, Oct.). *E. albida* Hitchc. (132, Kalkala). *E. cilianensis* (All.) Lutati (2, Mongonu, Oct.). *Diplachne fusca* (Linn.) Beauv. (129, Kalkala, June). *Leptochloa coerulescens* Steud. (33, Arege, Oct.). *Dinebra retroflexa* (Vahl) Panzer (40, Kalkala, Marte, both Nov.). *Dactyloctenium aegyptium* (Linn.) Beauv. (11, Mongonu to Arege, Oct.). *Coelachyrum obligobrachiatum* A. Camus (37, Arege, Oct.). *Chloris pilosa* Schum. (6, Mongonu, Oct.). *C. Gayana* Kunth (78, 21, Gusko, Oct., Kalkala, Jan.). *C. Prieurii* Kunth (127, 20, Gusko, Kauwa, both Oct., Shuari, Gumnari, Bodoweri, all Nov.). *Cynodon Dactylon* (Linn.) Pers. (104, 19, Baga Seyoram to Kalkala, Darrige, between Nigornu and Shuari). *Schoenefeldia gracilis* Kunth (7, Mongonu to Arege, Oct.). *Sporobolus spicatus* (Vahl) Kunth (18, Gusko, Shuari, Bodoweri, Darrige, Arege). *S. helvolus* (Trin.) Dur. et Schinz (38, Arege, Gumnari, Bodoweri, Kalkala). *Aristida adscensionis* Linn. (15, 32, Arege, Mongonu, both Oct.). *A. funiculata* Trin. et Rupr. (31, Mongonu to Arege ; Kauwa, Oct.). *A. stipoides* Lam. (106, 128, 125, Kalkala, Kauwa, Oct.). *A. pallida* Steud. (29, Kingowa, Oct.). *A. mutabilis* Trin. et Rupr. (126, Kauwa, Oct.). *Leersia hexandra* Sw. (84, Mafindere, Feb.). *Panicum repens* Linn. (105, 26, Baga Seyoram, Oct., Kalkala). *P. glabrescens* Steud. (130, Kalkala). *Sacciolepis africana* Hubbard et Snowden (109, Baga Seyoram, Bisagana, both Dec.). *Setaria verticillata* (Linn.) Beauv. (12, Mongonu). *Echinochloa obtusiflora* Stapf (118, Kasa, common in N. Dikwa Division, Oct.). *E. colonum* (Linn.) Link (119, 9, Mongonu, Gusko, Baga Seyoram, Oct., N. Dikwa Division, Oct.). *E. pyramidalis* (Lam.) Hitchc. et Chase (34, Bisagana, Darrige, Oct., Arege, Shurai, Kalkala). *E. stagnina* (Retz.) P. Beauv. (117, Gajibo, Kasa, both Oct., Asiya, Jan.). *Brachiaria lata* (Schum.) C. E. Hubbard (131, Kalkala). *B. xantholeuca* (Hack.) Stapf (8, Mongonu, Oct.). *B. ramosa* (Linn.) Stapf (78, Kalkala, Jan.). *Eriochloa nubica* (Steud.) Hack. et Stapf (113, Ngala, N. Dikwa Division, Oct.). *Pennisetum ramosum* (Hochst.) Schweinf. (114, 27, Kingowa, Oct., Marte, Ngala, N. Dikwa Division, Oct.). *P. mollissimum* Hochst. (22, Kukawa, between Kauwa and Baga, between Gumnari and Bodoweri, between Kalkala and Marte, Gusko, Oct.). *P. Rogeri*

Stapf et Hubbard (122, Wurge). *P. pedicellatum* Trin. (10, 41, 120, 121, Gusko, Wurge, Oct., Bisagana, Aziya, Maiduguri, Marte, Darrige, between Kauwa and Baga). *Cenchrus biflorus* Roxb. (13, Kalkala, Galarige, Fantaganari, between Mongonu and Bisagana). *Imperata cylindrica* Beauv. var. *Thunbergii* (Retz.) Dur. et Schinz (80, Kalkala, May). *Sorghum aethiopicum* Rupr. ex Stapf (77, Kalkala, Jan.). *Schizachyrium exile* (Hochst.) Stapf (5, Mongonu, Oct.). *Andropogon Gayanus* Kunth var. *squamulatus* (Hochst.) Stapf (108, 124, 28, Kingowa, Oct., Kauwa, Oct., Ngala, Oct., Mongonu, Jan.). *Cymbopogon proximus* (Hochst. ex A. Rich.) Stapf (4, Mongonu, Kauwa, Kingowa, Gusko, Galarige, Kukawa, N'Gornu, Fantanagari). *C. giganteus* (Hochst.) Chiov. (1, Shuari to Kalkala Kauwa, Gusko, Baga Seyoram, between Mongonu and N'Gornu). *Hyparrhenia dissoluta* (Steud.) C. E. Hubbard (123, Kauwa, Oct., Jillum, Oct., Mongonu, Jan.). *Vossia cuspidata* (Roxb.) Griff. (103, 82, Kalkala, May).

LXV—NOTES ON AFRICAN GRASSES: XXII.*

Tropical African Grasses. C. E. Hubbard.

Helictotrichon Thomasii *C. E. Hubbard* in Kew Bull. 1936, 500, diagn. tantum, et in Hill, Fl. Trop. Afr. **10,** 107 (1937), descr. angl.

Gramen perenne (?). *Culmi* geniculato-adscendentes, usque ad 1 m. longi, graciles, simplices, 3-nodes, paniculam et nodos versus asperuli, ceterum glabri laevesque. *Foliorum vaginae* internodiis breviores, angustae, glabrae, nervis retrorse scaberulae; ligulae truncatae, laceratae, circiter 1 mm. longae; laminae anguste lineares, tenuiter acutae, usque ad 18 cm. longae et 3 mm. latae, planae, demum reflexae, scaberulae, sparsissime pilosae vel glabrae. *Panicula* linearis, interrupta, 10–15 cm. longa, circiter 6 mm. lata; rhachis gracillima, scaberula; rami erecti, solitarii vel bini, simplices, 1–3-spiculati, filiformes, dense scaberuli, inferiores usque ad 3 cm. longi; pedicelli dense et minute hispiduli, laterales 1–2 mm. longi, terminales elongati. *Spiculae* anguste oblongae, 10–13 mm. longae, pallide virides, appressae. *Glumae* acutae, hyalinae; inferior anguste lanceolata, 2·5–3 mm. longa, 1-nervis, laevis; superior oblonga, 4–4·5 mm. longa, 3-nervis, carina scaberula. *Anthoecii* 3–4: rhachillae internodia circiter 2 mm. longa, pilis usque ad 1·5 mm. longis pilosa; callus obtusus, brevis, barbatus. *Lemmata* exserta, a latere visa oblongo-lanceolata et acuta, 6·5–7 mm. longa (inferiora), coriacea, marginibus angustis et apice hyalinis, 7-nervia, supra medium tenuiter scaberula, apice breviter biloba, lobis mucronatis; arista triente superiore lemmatis orta, geniculata, usque ad 1 cm. longa, columna laxe torta circiter 4 mm. longa. *Paleae* lineares, 5–6 mm. longae, carinis superne scabridis. *Antherae* 2 mm. longae. *Ovarium* hispidulum.

Sudan: Mongalla Province; Imatong Mtns., Mt. Kineti, in forest in ravine, 2700 m., *Thomas* 1862.

* Continued from K.B. 1937, 63.

Koeleria cristata (*L.*) *Pers.* var. **shiraënsis** *C. E. Hubbard* in Kew Bull. 1936, 500, diagn. tantum, et in Hill, Fl. Trop. Afr. **10,** 97 (1937), descr. angl.

Culmi e rhizomate brevi orti, erecti, usque ad 45 cm. alti, basin versus 2–3–nodes, validiusculi. *Foliorum vaginae* usque ad 28 cm. longae, glabrae ; laminae angustissime lineares, usque ad 30 cm. longae, explanatae circiter 2 mm. latae, conduplicatae, marginibus involutis, glabrae. *Panicula* lineari-oblonga vel anguste lanceolata, densa, inferne interrupta, 7·5–15 cm. longa, 1–2 cm. lata. *Spiculae* 6–7·5 mm. longae, 2–3-florae. *Glumae* carinis superne scaberulae vel ciliolatae ; inferior linearis, acuminata, 5–7 mm. longa, 1-nervis ; superior oblanceolato-oblonga vel anguste elliptico-oblonga, acute acuminata, 6–7·5 mm. longa, 3-nervis. *Lemmata* elliptico-oblonga, acuta, 5–7 mm. longa, lateribus laevibus, carinis superne scabridis vel ciliolatis. *Antherae* 2 mm. longae.

Tanganyika Territory : Shira Mtns., West of Mt. Kilimanjaro, 3000 m., *Haarer* 1122 A.

Agrostis Taylori *C. E. Hubbard* in Kew Bull. 1937, 63, diagn. tantum, et in Hill, Fl. Trop. Afr. **10,** 177 (1937), descr. angl.

Gramen perenne, 15–30 cm. altum, nonnunquam caespitosum. *Culmi* erecti, vel e basi brevi repente adscendentes, graciles, simplices, basi excepta enodes, glabri, laeves, internodia summo (pedunculo) demum exserto. *Folia* glabra ; vaginae imbricatae, tenuiter striatae, laeves ; ligulae ovato-oblongae vel oblongae, obtusae, 2–4 mm. longae, membranaceae ; laminae anguste lineares, apice obtusae vel subacutae, usque ad 12·5 cm. longae, planae vel siccitate involutae, usque ad 2 mm. latae, rigidiusculae vel flaccidae, erectae, apicem versus scaberulae. *Panicula* erecta, ovata vel ovato-oblonga, laxissima, 2·5–12·5 cm. longa, 1·2–5 cm. lata ; rhachis gracilis, glabra, laevis ; rami plerumque bini, laxe trichotomo-divisi, tenuiter filiformes, demum horizontaliter patentes, glabri, laeves, inferiores usque ad 5 cm. longi ; pedicelli laeves, 3–10 mm. longi. *Spiculae* elliptico-lanceolatae vel elliptico-oblongae, 2·5–3 mm. longae, virides et purpureo-tinctae ; rhachilla supra anthoecium brevissime producta, glabra, nonnunquam usque ad 0·4 mm. longa et anthoecium reductum ♀ gerens. *Glumae* subaequales vel superior inferiore paullo brevior, acutae vel obtusae, dorso et basin versus firme membranaceae, 3-nerves, nervis minute glandulosae, ceterum laeves ; inferior a latere visa lanceolata ; superior a latere visa lanceolato-oblonga. *Lemmata* late elliptica (explanata), emarginata vel truncato-emarginata, usque ad 2·5 mm. longa, membranacea, supra medium minute asperula, ceterum glabra et laevia, 5-nervia, nervis lateralibus excurrentibus et in mucrones tenues breves productis ; arista infra medium lemmatis orta, tenuissima, leviter geniculata, 2·5–4 mm. longa, columna 1–1·5 mm. longa ; callus brevissime barbatus. *Palea* oblonga, 1 mm. longa, hyalina, obscure 2-nervis vel enervis. *Antherae* 0·6–1 mm. longa. *Caryopsis* oblonga, 1·5 mm. longa.

Uganda: Kigezi District; Virunga Mtns., Mt. Muhavura, 3750 m., *Taylor* 2133 (typus, Herb. Mus. Brit.); Mt. Mgahinga, on crater rim below giant heaths, 3420 m., *Taylor* 1954.

Leptagrostis *C. E. Hubbard* in Kew Bull. 1937, 63, diagn. tantum.

Spiculae lanceolatae vel demum anguste oblongae, acuminatae, in paniculis angustis contractis breviter pedicellatae; rhachilla supra glumas disarticulans, supra anthoecium in setam tenuem brevem glabram vel leviter pubescentem producta. *Anthoecium* 1, ♀, glumae superiori aequilongum vel paullo longius. *Glumae* persistentes, lanceolatae, tenuiter acutae, acuminatae, superne carinatae, tenuiter membranaceae, inaequales; inferior superiore conspicue brevior, 1-nervis; superior 3-nervis. *Lemma* a latere visum anguste oblongum, dorso rotundatum, late lanceolatum (explanatum), acute acuminatum, apice integrum vel demum minutissime bidentatum, tenuiter membranaceum, 3–5-nerve, nervis lateralibus obscuris, nervo medio excurrente et in aristam rectam brevem producto; callus obtusus, pilis longis tenuissimis dimidiam partem lemmatis barbatus. *Palea angusta*, 2-nervis, lemmati fere aequilonga, membranacea. *Lodiculae* 2, oblongae, hyalinae. *Stamina* 3. *Ovarium* glabrum; styli distincti, breves; stigmata breviter plumosa, ex anthoeciis lateraliter exserta.—*Gramen* annum?, culmis gracilibus; foliorum laminae angustae, planae; ligulae ad seriem ciliorum redactae; paniculae graciles; anthoecium pilis flexuosis longis circumdatum.

Species 1, Abyssiniae incola.

Leptagrostis Schimperiana (*Hochst.*) *C. E. Hubbard* in Kew Bull. 1937, 63. *Calamagrostis Schimperiana* Hochst. in Flora, **38,** 202 (1855).

Culmi caespitosi, circiter 22 cm. alti, erecti, graciles, simplices, 2-nodes, glabri, laeves, internodiis superioribus demum exsertis. *Foliorum vaginae* striatae, ore pilosae, marginibus nonnunquam sparse ciliatae, ceterum glabrae, laeves; laminae anguste lineares, in apicem setaceum attenuatae, 10–12·5 cm. longae, 2–6 mm. latae, supra laxe pilosae et nervis dense asperulae, subtus glabrae et laeves. *Panicula* densiuscula, 5–12·5 cm. longa; rhachis gracillima, glabra, laevis; rami bini, erecti, tenuiter filiformes, divisi vel basi simplices, laeves; pedicelli 0·5–1 mm. longi. *Spiculae* 3·5–4 mm. longae, pallide brunneae et purpureo-tinctae. *Glumae* carina apicem versus scaberulae; inferior 2·5–3 mm. longa; superior 3·5–4 mm. longa. *Lemma* 3·7–4 mm. longum, glabrum, laeve; arista usque ad 1 mm. longa; callus pilis albis usque ad 3·5 mm. longis praeditus. *Palea* apice ciliolata. *Antherae* 1·5 mm. longae.

Abyssinia: Samen, 1854, *Schimper* 1330 (Herb. Mus. Hist. Nat. Paris).

Danthonia Davyi *C. E. Hubbard* in Kew Bull. 1936, 501, diagn. tantum, et in Hill, Fl. Trop. Afr. **10,** 137 (1937), descr. angl.

Gramen perenne, dense caespitosum, circiter 90 cm. altum, innovationibus intravaginalibus. *Culmi* erecti, graciliusculi, simplices, enodes, glabri, laevissimi. *Foliorum vaginae* basales stramineae, coriaceae, extra glabrae et nitentes, intus appresse strigosae, superiores imbricatae, arcte appressae, glabrae, laeves; ligulae ad seriem densam ciliorum redactae; laminae angustissime lineares, setaceae, pungentes, usque ad 60 cm. longae, arcte convolutae, circiter 2 mm. latae (explanatae), rigidae, virides, subtus glabrae et laeves, supra nervis minutissime hirsutae. *Panicula* lanceolata, laxa, 22 cm. longa, 4 cm. lata; rhachis gracilis, circa nodos scaberula et pubescens, ceterum glabra; rami fasciculati, filiformes, laxe divisi, glabri, inferiores usque ad 10 cm. longi; ramuli et pedicelli scaberuli; pedicelli apicem versus pubescentes, laterales usque ad 4 mm. longi. *Spiculae* usque ad 17 mm. longae. *Glumae* anguste lanceolatae, tenuiter acutae, spiculae aequilongae, flavidae, scariosae, glabrae, laeves, 3-nerves, nervis lateralibus brevibus. *Anthoecia* 3–4. *Lemmata* a latere visa lanceolata, 3·5–4 mm. longa (lobis exclusis), firme membranacea, obscure 9-nervia, circa medium et prope margines fasciculis circiter 3 pilorum alborum usque ad 3·5 mm. longorum praedita, ceterum glabra; lobi lanceolati, tenuiter acuti, nonnunquam mucronati, 4 mm. longi; arista geniculata, prope basin semel tantum torta, usque ad 11 mm. longa; callus obtusus, usque ad 1 mm. longus, pilis albis usque ad 2 mm. longis barbatus. *Paleae* lineari-lanceolatae, bifidae, 7 mm. longae, carinis minute ciliolatae. *Lodiculae* ciliolatae. *Antherae* 3 mm. longae.

NYASALAND: Mt. Mlanje, on steep grass slopes of the Lichenya Gorge, 1950 m., *Burtt Davy* 2068/29.

Pentaschistis imatongensis *C. E. Hubbard* in Kew Bull. 1936, 501, diagn. tantum, et in Hill, Fl. Trop. Afr. **10,** 130 (1937), descr. angl.

Gramen perenne, dense caespitosum, 60–68 cm. altum. *Culmi* erecti, graciliusculi, simplices, prope basin 1–2-nodes, internodio summo (pedunculo) longe exserto glabro laevi eglanduloso. *Folia* inferiora pilis brevibus patulis molliter pilosa, superiora glabrescentia vel glabra; vaginae imbricatae, latiusculae, tenuiter striatae, inferiores pallidae et laxae; ligulae ad seriem ciliorum redactae; laminae lineares, in apicem obtusum gradatim attenuatae, usque ad 20 cm. longae, 2–5 mm. latae, planae, flaccidae, eglandulosae, marginibus scaberulae. *Panicula* erecta, contracta, densiuscula, 7·5–12·5 cm. longa, 1·2–1·8 cm. lata; rhachis laevis, eglandulosa; rami erecti, tenuiter filiformes, laeves, eglandulosi, basi nudati et simplices, supra basin divisi et dense spiculati; pedicelli 0·5–4 mm. longi. *Spiculae* pallidae, 6–6·5 mm. longae. *Glumae* a latere visae oblique lanceolatae, acuminatae, tenuiter acutae, scarioso-membranaceae, 3-nerves, nervis lateralibus brevissimis, glabrae, carina minute scaberulae. *Lemmata* a latere visa oblongo-lanceolata, 2–2·4 mm. longa (lobis exclusis), dorso pilis appressis sparse pubescentia, obscure nervia; lobi 0·3–0·4 mm. longi, obtusi, setam

tenuem 2–2·5 mm. longam gerentes ; arista geniculata, 7–9 mm. longa, columna torta 2–2o5 mm. longa. *Paleae* lineari-oblongae, 3 mm. longae. *Antherae* 1 mm. longae. *Caryopsis* 2 mm. longa.

SUDAN : Mongalla Province ; Imatong Mtns., Mt. Kineti, 3000 m., rocky summit, common, *Thomas* 1834.

Pentaschistis Mannii *Stapf* ex Maitland in Kew Bull. 1932, 425, nomen ; ex Hutch. in Hutch. & Dalz. Fl. W. Trop. Afr. **2,** 528 (1936), descr. angl. ; ex C. E. Hubbard in Kew Bull. 1936, 501, diagn. tantum, et in Hill, Fl. Trop. Afr. **10,** 134 (1937), descr. angl.

Gramen perenne, dense caespitosum, 8–30 cm. altum, innovationibus intravaginalibus numerosis. *Culmi* erecti, gracillimi, simplices, 1–2-nodes vel basi excepta enodes, glabri, paniculam versus glandibus minutis sessilibus praediti vel eglandulosi. *Foliorum vaginae* imbricatae, striatae, laeves, nervis nonnunquam glandulosae, ore plerumque barbatae, ceterum pubescentes, vel omnino glabrae, inferiores latae et laxae ; ligulae ad seriem densam ciliorum redactae ; laminae anguste lineares, subsetaceae, apice obtusae, usque ad 10 cm. longae, arcte involutae, usque ad 3 mm. latae (explanatae), rigidiusculae, glabrae vel pubescentes, marginibus scaberulis exceptis laeves. *Panicula* angusta, contracta et densa, 2·5–7·5 cm. longa, 0·4–1·8 cm. lata ; rhachis et rami glandulosi vel eglandulosi ; rami erecti, capillares, plerumque paucispiculati, inferiores bini, usque ad 2·5 cm. longi ; pedicelli 1–5 mm. longi. *Spiculae* 6–7·5 mm. longae, pallide virides, purpurascentes vel albidae. *Glumae* a latere visae lanceolatae et acuminatae, tenuiter scariosae, 1-nerves, glabrae, carina plerumque prominenter scaberulae vel minute scabrido-ciliolatae. *Lemmata* a latere visa lanceolato-oblonga vel anguste elliptico-oblonga, 2–2·5 mm. longa (lobis exclusis), inferne sparse et appresse pubescentia, obscure 7-nervia ; lobi obtusi, usque ad 0·4 mm. longi, setam tenuem 2–4 mm. longam gerentes ; arista geniculata, 6–9 mm. longa, columna torta 2–3 mm. longa. *Paleae* anguste oblongae, 2–2·5 mm. longae. *Antherae* 1 mm. longae. *Caryopsis* 1·5 mm. longa.

SOUTHERN NIGERIA : Cameroons Mtn., in grassland and on bare rocky ground, 2700–4050 m., *Mann* 1351 (typus), 2075 ; *Dalziel* 8353 ; *Maitland* 878, 1244, 1249, 1260 ; *Migeod* 186, 197 ; *Mildbraed* 10894, 10894a ; *Johnston* 47 ; *Steele* 34 ; *Bornmüller* 25.

Pentaschistis meruensis *C. E. Hubbard* in Kew Bull. 1936, 501, diagn. tantum, et in Hill, Fl. Trop. Afr. **10,** 127 (1937), descr. angl.

Gramen perenne, dense caespitosum, 15–60 cm. altum, innovationibus intravaginalibus. *Culmi* erecti, e rhizomate brevi orti, graciles, simplices, 1-nodes vel basi excepta enodes, internodio summo (pedunculo) exserto purpureo glabro paniculam versus glandibus ellipticis vel orbiculatis sessilibus praedito ceterum laevi. *Foliorum vaginae* imbricatae, inferiores latae, laxae, glanduloso-tuberculatae, pilis mollibus patentibus laxe vel dense pilosae vel villosae, superiores arcte appressae, dense pilosae vel pubescentes ; ligulae ad seriem densam ciliorum redactae ; laminae anguste

lineares, superne subsetaceae et flexuosae, 7·5–25 cm. longae, arcte involutae vel explanatae et basi usque ad 3 mm. latae, rigidiusculae, pubescentes vel molliter pilosae vel glabrescentes, marginibus glanduloso-tuberculatae. *Panicula* laxa et ovata, vel nonnihil contracta, 5–12·5 cm. longa, usque ad 6 cm. lata ; rhachis et rami ut pedunculus glanduliferi ; rhachis gracillima, superne capillaris ; rami plerumque bini, demum patuli et nutantes, capillares, basi nudati, laxe trichotomo-divisi, inferiores usque ad 6 cm. longi ; pedicelli valde inaequales, 2–20 mm. longi. *Spiculae* 6–8 (plerumque 7–8) mm. longae, basin versus purpureae, ceterum pallide flavidae vel albidae, vel omnino pallidae. *Glumae* a latere visae oblique et anguste lanceolatae, tenuiter acutae, acuminatae, 3-nerves, nervis lateralibus brevissimis, tenuiter scariosae, carina plus minusve scaberulae, juveniles prope margines plerumque leviter pubescentes. *Lemmata* a latere visa lanceolato-oblonga, 3–4 mm. longa (lobis exceptis), tenuiter pubescentia, 9-nervia ; lobi acuti vel obtusi, 0·5–0·7 mm. longi, setam tenuem 4–7 mm. longam gerentes ; arista geniculata, 8–14 mm. longa, columna torta 3–4 mm. longa ; callus pilis 1 mm. longis barbatus. *Paleae* lineari-oblongae, usque ad 2 mm. longae. *Antherae* 2·5 mm. longae. *Caryopsis* circiter 2 mm. longa.

Tanganyika Territory : Arusha District ; Mt. Meru, dry open tussock-grass steppe, above the wooded region, 3090–3900 m., *Troll* 5707 (Herb. Berol.) ; dominant plant on sandy ash scree above *Erica* zone, 3600–3750 m., *Burtt* 4062 (typus) ; rocky slopes, 3600 m., *Uhlig* 608 ; steep stony slopes, 3600 m., *Uhlig* 1067 ; at the summit, 4680 m., *Uhlig* 602.

Pentaschistis ruwenzoriensis *C. E. Hubbard* in Kew Bull. 1936, 500, diagn. tantum, et in Hill, Fl. Trop. Afr. **10,** 127 (1937), descr. angl.

Gramen perenne, laxe caespitosum, 36–60 cm. altum. *Culmi* e rhizomate multinodi repente orti, erecti vel basi geniculati, graciliusculi, simplices, infra medium 1–2-nodes, glabri, laeves, paniculam versus glanduliferi. *Foliorum vaginae* laxae, pilis patulis laxe vel sparse pilosae, vel glabrescentes, inferiores pallidae, latiusculae, chartaceo-scariosae ; ligulae ad seriem densam ciliorum redactae ; laminae anguste lineares, in apicem tenuem obtusum gradatim attenuatae, usque ad 25 cm. longae, 2–3 mm. latae, planae, nonnihil flaccidae et flexuosae, laxe pilosae vel glabrescentes, supra crebre nervatae, marginibus basin versus glanduloso-tuberculatae. *Panicula* contracta, densiuscula, 6–10 cm. longa, 1·2–2·5 cm. lata ; rhachis glandibus minutis ellipticis vel orbiculatis praedita ; rami erecti, bini, basi nudati, capillares, ut rhachis glanduliferi ; pedicelli 2–10 mm. longi. *Spiculae* 7–9 mm. longae, infra medium purpureae et virides, supra medium albidae. *Glumae* a latere visae oblique lanceolatae, acuminatae, tenuiter acutae, subhyalinae, glabrae, supra medium carina scaberulae, 3-nerves, nervis lateralibus brevissimis. *Lemmata* a latere visa oblongo-lanceolata, 2·6–3 mm.

longa (lobis exclusis), dorso et marginibus laxe pubescentia, 7–9-nervia ; lobi 0·6 mm. longi, acuti, setam tenuem 3–5 mm. longam gerentes ; arista geniculata, 11–17 mm. longa, columna torta 2·5–3·5 mm. longa, seta laxe torta. *Paleae* lineari-oblongae, 4 mm. longae. *Antherae* 2·5–3 mm. longae. *Caryopsis* 2 mm. longa.

Uganda : Toro District ; Mt. Ruwenzori, Namwamba Valley, on rocks in River Namwamba, 3090 m., *Taylor* 2903.

Danthoniopsis intermedia *C. E. Hubbard* in Kew Bull. 1936, 500, diagn. tantum, et in Hill, Fl. Trop. Afr. **10,** 78 (1937), descr. angl.

Gramen perenne, dense caespitosum, usque ad 60 cm. altum. *Culmi* erecti, graciles, simplices, 2-nodes, internodio infimo sublanato vel glabro, ceterum glabri et laeves. *Foliorum vaginae* teretes, tenuiter striatae, internodiis breviores, dense et breviter pilosae ; nodi dense villosuli ; ligulae ad seriem densam ciliorum redactae ; laminae lineares, in acumen tenue attenuatae, usque ad 15 cm. longae et 4·5 mm. latae, planae vel siccitate convolutae, molliter pilosae, marginibus scaberulis cartilagineis, uno margine crispo. *Panicula* linearis, densiuscula, 10–14 cm. longa, 1·2 cm. lata ; rhachis gracilis, nodis pubescentibus vel villosulis exceptis glabra ; rami erecti, solitarii, pubescentes, usque ad 2·5 cm. longi ; pedicelli 0·5–3 mm. longi. *Spiculae* elliptico-lanceolatae, acuminatae, 9–10 mm. longae, pallidae, nervis viridibus. *Glumae* firme membranaceae ; inferior elliptico-ovata vel elliptica, subacuta, 4–5 mm. longa, 3-nervis, apice pilis paucis minutis praedita, ceterum glabra ; superior lanceolato-oblonga, rostrato-acuminata, apice obtusa, spiculam aequans, 5-nervis, glabra. *Anthoecium inferum* ♂ : lemma lanceolato-oblongum, acuminatum, apice obtusum, 7·5–8 mm. longum, 7-nerve, glabrum ; palea anguste oblonga, obtusa, 6 mm. longa, carinis apicem versus ciliolata. *Anthoecium superum* anguste oblongum : callus 0·6 mm. longus, rotundato-obtusus, pilis usque ad 2·5 mm. longis dense barbatus ; lemma 4 mm. longum (lobis exclusis), bilobum, lobis acutis 1·5–1·8 mm. longis, 9-nerve, basi dense barbatum, prope medium pilorum alborum fasciculis 8 in unam seriem transversam dispositis barbatum ; arista 10–12 mm. longa, columna scaberula 4 mm. longa ; palea anguste oblonga, 4·5 mm. longa, carinis e basi ad medium alatis, alis ciliolatis apice auriculatis. *Antherae* 3 mm. longae.

Northern Rhodesia : Broken Hill, *Broken Hill Govt. School* 12.

Rhynchelytrum reynaudioides *C. E. Hubbard ex Mildbraed* in Notizbl. Bot. Gart. Berlin, **13,** 697 (1937), diagn. angl. *Melinis reynaudioides* Mez ex Mildbraed, Wiss. Ergebn. Deutsch. Zentr.-Afr. Exped. 1910–11, **2,** Bot. 160 (1922), nomen.

Gramen perenne, circiter 25 cm. altum. *Culmi* graciles, teretes, multinodes, infra medium simplices vel parce ramosi, supra medium multiramosi, ramis approximatis, glabri, laeves. *Foliorum vaginae* internodiis longiores, arcte appressae vel demum laxae, tenuiter

striatae, glabrae vel ore pilis paucis gerentes, laeves; ligulae ad seriem ciliorum redactae; laminae lanceolato-lineares, in apicem subpungentem attenuatae, 1·5–9·5 cm. longae, usque ad 4 mm. latae, planae vel siccitate involutae, patentes, rigidae, glabrae, laeves. *Panicula* anguste oblonga, densa, 2–3 cm. longa, circiter 6 mm. lata (aristis exclusis); rhachis pubescens vel glabrescens; rami erecti, usque ad 1·5 cm. longi, filiformes, pubescentes, demum glabri; pedicelli 1–4 mm. longi, minute pubescentes. *Spiculae* oblongae, 2·5–2·7 mm. longae. *Gluma inferior* late ovata, obtusa, 0·5 mm. longa, membranacea, enervis, breviter pilosa; gluma superior spicula paullo brevior, late oblonga, obtuse et brevissime biloba, dorso leviter curvata, firme membranacea, 5–nervis, nervo medio in aristam scaberulam 3·5–5·5 mm. longam excurrente, dorso laxe pilosa. *Anthoecium inferum* ♂: lemma spiculae aequilongum, gluma superiore paullo latius, late elliptico-oblongum, obtuse et brevissime bilobum vel emarginatum, firme membranaceum, tenuiter 7–9-nerve, infra apicem nervis anastomosantibus, nervo medio in aristam flexuosam scaberulam 6·5–7 mm. longam excurrente, pubescens; palea oblonga, 2 mm. longa, carinis scaberula. *Anthoecium superum* ♀: lemma elliptico-oblongum, obtuse et brevissime bilobum vel emarginatum, 2 mm. longum, tenuiter membranaceum, hyalinum, 5-nerve, nervo medio in aristam flexuosam scaberulam 3·3–5 mm. longam excurrente, apice ciliolatum, dorso pilis paucis gerens, ceterum glabrum, laeve; palea late oblonga, truncata (explanata), 1·3 mm. longa, hyalina, glabra; antherae 1·8 mm. longae.

Annobon Is.: on lava cliffs, Oct. 1911, *Mildbraed* 6762 (typus, Herb. Hamburg).

Setaria Mildbraedii *Mez* ex Mildbraed, Wiss. Ergebn. Deutsch. Zentr.-Afr. Exped. 1910–11, **2,** Bot. 160 (1922), nomen; ex Mildbraed in Notizbl. Bot. Gart. Berlin, **13,** 697 (1937), diagn. angl.; affinis *S. angustissimae* Stapf, sed culmis gracilioribus, inflorescentiis brevioribus angustioribus, spiculis minoribus differt.

Gramen perenne vel annuum (?), laxe caespitosum, circiter 30 cm. altum. *Culmi* geniculato-adscendentes, gracillimi, rigidiusculi, teretes vel basin versus leviter compressi, usque ad 6-nodes, ramosi, glabri, laeves. *Foliorum vaginae* internodiis longiores, laxae, tenuiter striatae, angustae, superne plus minusve compressae et carinatae, glabrae vel ore pilis brevibus paucis praeditae; ligulae ad seriem ciliorum brevium redactae; laminae anguste lineares, basin versus gradatim attenuatae, apice tenuiter setaceae, usque ad 20 cm. longae, 1–2·8 mm. latae, planae, flexuosae vel curvatae, flaccidiusculae, glabrae, subtus laeves, supra nervis asperulae. *Inflorescentia* gracilis, angustissima, laxiuscula, 1–6 cm. longa, 2–3 mm. lata; axis primarius gracillimus, glaber, tenuiter scaberulus; rami filiformes, erecti, solitarii, inferiores 4–8 mm. longi et 2–7 mm. distantes, paucispiculati; setae solitariae, tenuiter filiformes, 2·5–4 mm. longae, minute scaberulae; pedicelli usque ad

0·5 mm. longi, apice discoidei. *Spiculae* a latere visae semi-elliptico-oblongae vel oblongae, a dorso visae anguste ellipticae, acutae, 1·5–1·7 mm. longae, pallide virides. *Gluma inferior* late ovata, acuta, circiter 1 mm. longa, 3–4-nervis, tenuiter membranacea; gluma superior late elliptica, subacuta, spiculae aequilonga, 5–sub7-nervis, tenuiter membranacea. *Anthoecium inferum* sterile: lemma glumae superiori simile sed obtusum; palea oblonga, bifida, 0·5 mm. longa, hyalina. *Anthoecium superum* a dorso visum elliptico-oblongum et subacutum, apiculatum, a latere visum semi-elliptico-oblongum, 1·3–1·5 mm. longum, pallidum, laeve: lemma et palea tenuiter coriacea; antherae 1 mm. longae.

Annobon Is.: lava cliffs on the north coast, tufts between rocks, *Mildbraed* 6716 (typus, Herb. Berol.).

South African Grasses.

C. E. Hubbard and H. G. Schweickerdt.

Eragrostis hygrophila *C. E. Hubbard et Schweickerdt*, sp. nov.; affinis *E. peregrinae* Wieg., sed spiculis paullo angustioribus plerumque longioribus 7–15-floris, lemmatibus obtusis vel subacutis paullo brevioribus differt.

Gramen annuum, laxe caespitosum, 6–40 cm. altum. *Culmi* erecti vel geniculato-adscendentes, graciles, simplices vel ramosi, 2–4-nodes, prope nodos plerumque minute glanduloso-punctati, glabri, laeves. *Foliorum vaginae* internodiis demum multo breviores, plus minusve laxae, tenuiter striatae, glabrae, laeves; ligulae ad seriem ciliorum brevissimorum redactae; laminae anguste lineares, in apicem subsetaceum attenuatae, usque ad 17 cm. longae, 1–3·5 mm. latae, planae vel siccitate convolutae, subtus glabrae, laeves, supra nervis dense asperulae. *Panicula* lineari-oblonga, oblonga, lanceolata vel ovata, contracta et densiuscula, vel plus minusve laxa, 3–15 cm. longa, 0·6–5 cm. lata; rhachis et rami nonnunquam parce glanduloso-punctati; rhachis glabra, laevis; rami solitarii vel bini, e basi plerumque spiculiferi, divisi, ramulis brevibus ramis appressis, erecti vel patentes, tenuiter filiformes, glabri, laeves vel parce scaberuli, inferiores usque ad 5 cm. longi; pedicelli scaberuli, 0·5–3 mm. longi. *Spiculae* lineares, 3–7 mm. longae, circiter 1 mm. latae, 7–15-florae, olivaceo-virides vel purpureo-variegatae; rhachilla persistens, flexuosa, internodiis 0·5–0·6 mm. longis. *Glumae* tenuiter membranaceae; inferior lanceolato-oblonga (explanata), obtusa, 0·4–0·7 mm. longa, enervis; superior oblongo-elliptica (explanata), obtusa, 0·9–1 mm. longa, 1-nervis, carina minute scaberula. *Lemmata* imbricata, a latere visa lanceolato-oblonga vel anguste oblonga, obtusa vel subacuta, elliptico-ovata (explanata), 1·3–1·5 mm. longa, membranacea, nervis lateralibus parce et minute scaberula, carina supra medium minute scaberula, demum decidua. *Paleae* a latere visae curvatae, a dorso visae oblongae, truncatae, 1–1·3 mm. longae, tenuiter membranaceae, carinis minute scaberulae, persistentes vel demum deciduae. *Antherae* circiter 0·2 mm. longae. *Caryopsis* ambitu oblonga, 0·6–0·8 mm. longa.

South West Africa. Great Namaqualand: Gawachab, near Seeheim, Febr. 1909, *Pearson* 4080; Ganus, near Kalkfontein, Febr. 1909, *Pearson* 4487.

South Africa. Cape Province: Prieska Distr.; Kranzfontein, March 1934, *Wilman in McGregor Mus.* 3061; Prieska, Jan.-April 1936, *Bryant in McGregor Mus.* 4195; Barkly West Distr.: Danielskuil, Jan. 1934, *Wilman in McGregor* Mus. 3069; Newlands, May 1934, *Paton in McGregor Mus.* 3137; Likatlong, March 1934, *Wilman*; Barkly West, March 1934, *Brewer in McGregor Mus.* 3068. Kimberley Distr.; Windsorton, March 1936, *Acocks* 92; Macfarlane, Febr. 1934, *Wilman*; Kimberley, Febr. 1937, *Acocks* (1875) *in McGregor Mus.* 4189 (typus); Kimberley, along Boshof road, Febr. 1937, *Wilman in McGregor Mus.* 4083; Jan. 1925, *Wilman in McGregor Mus.* 2469; Mauretzfontein, Jan. 1934, *Wilman in McGregor Mus.* 3259; Karreepan, Dec. 1933, *Wilman in McGregor Mus.* 3213; Blaauwkrantz, March 1937, *Acocks* 1896; Doornlaagte, Febr. 1937, *Wilman in McGregor Mus.* 4082: Herbert Distr.; Honeynestkloof, March 1920, *Wilman in McGregor Mus.* 557; Graspan, April 1937, *Esterhuysen in McGregor Mus.* 4192; Ottawa, April 1937, *Esterhuysen in McGregor Mus.* 4193: Hay Distr.; Lanyon Vale, March 1937, *Acocks* (1947) *in McGregor Mus.* 4194: Britstown Distr.; Britstown, Giesen's Kraal, April 1917, *Wilman in McGregor Mus.* 2668: Black Ridge, March 1934, *Wilman in McGregor Mus.* 3261.

Locally common and often abundant in wet places, or where water had remained for some time after the rains.

Eragrostis Wilmaniae *C. E. Hubbard et Schweickerdt*, sp. nov.; affinis *E. macrochlamydi* Pilger, sed paniculis minoribus, glumis brevioribus, foliis et glumis eglandulosis differt.

Gramen annuum, laxe vel dense caespitosum. *Culmi* 6–25 cm. longi, vel erecti vel geniculato-adscendentes vel prostrati, gracillimi, simplices vel plerumque ramosi, 2–4-nodes, glabri, laeves. *Foliorum vaginae* internodiis demum multo breviores, plerumque laxae, carinatae, tenuiter striatae, ore brevissime pilosae, ceterum glabrae, laeves; ligulae ad seriem densam ciliorum redactae; laminae angustissime lineares, in apicem subsetaceum gradatim attenuatae, 2–10 cm. longae, 1–2 mm. latae, planae vel siccitate convolutae, glabrae, supra nervis asperulae, subtus laeves. *Panicula* ambitu vel linearis vel anguste oblonga vel ovata, densa vel plus minusve interrupta, 1–3 (raro 5) cm. longa, 0·5–1·4 cm. lata; rhachis rigida, glabra, fere laevis; rami solitarii, erecti vel leviter patentes, dense spiculati; pedicelli brevissimi. *Spiculae* latissime ovato-ellipticae vel orbiculato-ellipticae, valde compressae, 3–4 mm. longae, 2·5–3 mm. latae, 6–9-florae, albido-virides, vel purpureo- vel plumbeo-tinctae; rhachilla supra glumas et inter anthoecia disarticulans. *Glumae* subaequales, 2–4 mm. longae, lanceolatae (explanatae), acutae vel acute acuminatae, membranaceae, carina plus minusve minute scaberulae; inferior plerumque 1-nervis; superior 3-nervis.

Lemmata imbricata, a latere visa oblique ovata, acuta, 2·3-3 mm. longa (inferiora), carinata, minutissime granulata, membranacea, glabra, carina apicem versus minute scaberula. *Paleae* lanceolatae vel lanceolato-oblongae, obtusae vel truncatae, 1·7–2 mm. longae, carinis inferne anguste alatae, alis minute ciliolatis. *Antherae* 0·3 mm. longae. *Caryopsis* ambitu oblonga, 0·8–1 mm. longa, subtrigona.

South Africa. Cape Province: Barkly West District; Boetsap, Febr. 1934, *Swan in McGregor Mus.* 2989; Newlands, on limestone, March 1934, *Brewer in McGregor Mus.* 3036; Newlands, May 1934, *Paton in McGregor Mus.* 3139. Herbert District; Honeynestkloof, damp places, March 1920, *Wilman in McGregor Mus.* 558 (typus). Hay District; Groot Doorn, Banksfontein, sandy soil, March 1921, *Wilman in McGregor Mus.* 1411.

Aristida capensis *Thunb.* var. **Dieterleniana** *H. G. Schweickerdt*, var. nov.: a typo glumis subaequalibus extra pubescentibus differt.

South Africa. Basutoland: Quthing Distr., Industrial School, Leloaleng, 22.1.1916, brownish flower, *Dieterlen* 1205 (Nat. Herb. Pretoria, Kew and Paris). Orange Free State: Ladybrand Distr., Westminster, March 1934, *Celliers* 11 (typus; Nat. Herb. Pretoria and Kew).

The above variety superficially resembles *Aristida sericans* Hack. It may be readily distinguished, however, by the pronounced articulation of the lemma.

Mauritius Grasses.

C. E. Hubbard.

Arthraxon mauritianus Stapf, ms., sp. nov.; affinis *A. micanti* (Nees) Hochst., sed spiculis sessilibus angustioribus, gluma inferiore scabrida, pedicellis et rhacheos internodiis superne longius ciliatis differt.

Gramen annuum. *Culmi* e basi repente ramosa geniculato-adscendentes, e nodis inferioribus radicantes, usque ad 40 cm. longi, graciles vel gracillimi, laxe ramosi, multinodes, internodiis inferioribus 1–3 cm. longis, inflorescentiam versus pubescentes, ceterum glabri, laeves. *Foliorum vaginae* nodis breviter barbatae, tenuiter striatae, ciliatae, superne pilis e tuberculis ortis laxe pilosae, vel glabrescentes et tuberculatae, vel laeves; ligulae brevissimae, truncatae, membranaceae; laminae lanceolatae vel anguste ovatae, basi cordatae, apice tenuiter acuminatae, 1–4 cm. longae, 5–10 mm. latae, planae, patentes, utrinque sparse vel laxe pubescentes, marginibus pilis rigidis e tuberculis ortis laxe ciliatae, vel glabrescentes. *Racemi* 3–10, graciles, 1·5–3·5 cm. longi; rhacheos internodia gracillima, 2·5–3 mm. longa, pilis 2–3 mm. longis ciliata; pedicelli internodiis similes, sed 2 mm. longi. *Spiculae sessiles* a latere visae oblique lineari-lanceolatae, acutae, 4–5 mm. longae, pallidae vel purpurascentes; callus pilis circiter 1 mm. longis barbatus; gluma inferior lanceolato-oblonga (explanata), acuminata,

dorso convexa, scabrida, 6–7-nervis ; gluma superior anguste elliptico-oblonga (explanata), acute acuminata, carinata, carina supra medium scabrido-ciliolata, 3-nervis ; lemma inferum 2·5 mm. longum, glabrum ; lemma superum 2–3 mm. longum, minute bi obum ; arista geniculata, 9–14 mm. longa ; antherae 2, 0·5–0·7 mm. longae. *Spiculae pedicellatae* 2 mm. longae, ad glumam inferiorem redactae, vel plerumque nullae.

MAURITIUS : Mt. Pouce, near the summit and at Chateau d'Eau, April 1857, *Ayres* 47 (typus) ; Mt. Long, *Bouton* 1 ; Baie du Cap, in rock-crevices, *Vaughan* 1851 ; without precise locality, *Ayres*, *Boivin*, *Bouton* s.n., G.65.

Arthraxon lanceolatus (Roxb.) Hochst., to which several of the above specimens were referred by Baker (Fl. Maurit. & Seych. 444 : 1877), is a perennial triandrous species from India.

Brachiaria serpens (*Kunth*) *C. E. Hubbard*, comb. nov. *Panicum repens* Nees, Agrost. Bras. 236 (1829), non L. *P. serpens* Kunth, Rév. Gram. **1**, 38 (1829). *P. parvifolium* Lam. var. *serpens* Baker, Fl. Maurit. & Seych. 438 (1877).

Distrib. Mauritius and Réunion.

Vetiveria arguta (*Steud.*) *C. E. Hubbard*, comb. nov. *Andropogon argutus* Steud. Syn. Pl. Glum. **1,** 391 (1854). *A. squarrosus* L. f. var. *chrysopogonoides* Hack. in DC. Monogr. Phan. **6,** 544 (1889).

Distrib. Mauritius and Rodriguez.

Dichanthium aristatum (*Poir.*) *C. E. Hubbard*, comb. nov. *D. nodosum* Willem. in Usteri, Ann. Bot. **18,** 11 (1796), nomen illegit. *Andropogon aristatus* Poir. in Lam. Encycl. Meth. Bot. Suppl. **1,** 585 (1810). *A. mollicomus* Kunth, Rév. Gram. **1,** 365, t. 96 (1830). *Diplasanthum lanosum* Desv. Opusc. 67, t.5, fig. 1 (1831). *Lepeoceris mollicoma* (Kunth) Nees in Edinb. N. Phil. Journ. **18,** 185 (1835). *Andropogon caricosus* L. subsp. *mollicomus* Hack. var. *mollicomus* (Kunth) Hack. in DC. Monogr. Phan. **6,** 569 (1889). *A. nodosus* (Willem.) Nash in N. Amer. Fl. **17,** 122 (1912).

Distrib. South East Africa, Mauritius, Rodriguez, Réunion, South India ; introduced into Polynesia, Australia and the West Indies.

Eragrostis tenella (*L.*) *Beauv. ex Roem. et Schult.* var **insularis** *C. E. Hubbard*, var. nov., a var. *tenella* (L.) Hook. f. paniculis linearibus contractis 5–15 cm. longis 6–10 mm. latis, rhachi glabra, ramis erectis differt.

MAURITIUS : canefields near Moka, *Vaughan* 1937 (typus) ; roadside near Quatre Bornes, *Vaughan* A.70 ; without precise locality, *Bouton* G.33.

Isachne mauritiana *Kunth* var. **Bojeri** *C. E. Hubbard*, var. nov., a typo foliorum vaginis glabris vel marginibus leviter ciliatis, ligulis nullis, laminis 8–14 cm. longis 4·5–9 mm. latis glabris laevibus, paniculis 9–12 cm. longis 7–12 cm. latis, ramis laevibus, pedicellis

2–8 mm. longis, spiculis obovoideis vel ellipsoideis 1·3–1·6 mm. longis, lemmatibus 1–1·3 mm. longis differt.

MAURITIUS: Mt. Pouce, *Ayres* 43; without precise locality, *Bojer* (typus), *Sieber* II.32.

LXVI—SOME OBSERVATIONS ON ENCEPHALARTOS KOSIENSIS HUTCH. B. M. L. OGILVIE (Natal Herbarium).

The original description of this species by Hutchinson in K.B. 1932, 52, and the subsequent enumeration by Hutchinson and Rattray in Hill, Flora Capensis, **5**, pt. 2, 34 (1933) are somewhat incomplete owing to lack of material. As copious living material has since come to hand it was thought desirable to amend and amplify the original description of this species.

Plants of *E. kosiensis* Hutch. were collected some years ago at the type locality, Kosi Bay, Zululand, and grown in the grounds of the Natal Herbarium, the Durban Botanic Gardens and the Old Fort, Durban. Among these there is only one female plant which has borne a cone, and I am very grateful to Mr. E. R. Thorp, the Gardener in charge of the Botanic Gardens, for giving me material of this plant, and the cone for examination. I should also like to express here my gratitude to Dr. H. G. Schweickerdt of the Natal Herbarium who has so generously given me his advice and much assistance, and to Dr. A. P. D. McClean of the Natal Herbarium who very kindly photographed the plants growing in the Botanic Gardens.

Encephalartos kosiensis *Hutch.* emend. et ampl. B.M.L.Ogilvie.—Hutch. in K.B. 1932, 512; Hutch. et Rattray in Hill, Fl. Cap. **5**, pt. 2, 34, fig. 5 (1933). *Encephalartos* sp. sec Aitken et Gale in Bot. Survey. S. Afr., Mem. 2, p. 18 (1921).

Planta caulescens; caulis simplex usque ad 45 cm. altus (fide Gerstner). *Folia* circiter 1 m. longa, rachis glabra, supra haud canaliculata; foliola glabra, circiter 25-juga, conferta et leviter imbricata, oblongo-elliptica, sessilia, basi latissima et inaequalia, supra fere cordata, infra fere directa, apice 3–5-lobata, lobis late triangularibus pungentibusque, marginibus recurvis, superioribus dentibus 3–4 lateralibus minoribus armatis, inferioribus dentibus 0–3, 9–16 cm. longa, 4–6 cm. lata, nervis parallelis distinctis circiter 50. *Strobili* ♂ 1–2, pedunculo pubescente 12 cm. longo praediti, aurantiaci, cylindrici, apicem et basem versus gradatim angustati, circiter 39 cm. alti, 9–10 cm. diam.; squamae glabrae, obovatae, apice irregulariter rhomboideae, leviter rugosae, 2·5–3 cm. latae, 1–1·5 cm. altae. *Strobili* ♀ 1–2 (fide Aitken et Gale), pedunculo glabro albo 9 cm. longo praediti, splendide aurantiaci, ovoidei, apice aliquantulum plani, 27 cm. alti, 19–20 cm. diam.; squamae glabrae, spiraliter 8–10-seriatae, apice irregulariter rhomboideae, leviter rugosae, 3·5–5·5 cm. latae, 2·5–3·5 cm. altae. *Semina* splendide aurantiaca, oblonga, plus minusve 3-angulata, 4·5 cm. longa, 1·5 cm. diam.

ZULULAND : East of Ingwavuma, near Kosi Lake, in sand-dune bush, 1920, *Aitken and Gale* 63 (Nat. Herb. Pret.) ; without precise locality, 1935, *B. Nicholson* (Nat. Herb. Pret.) ; Kosi Bay, 1921, *Colonel Lugge* in Natal Herb. no. 16507.

CULTIVATED : Durban, cult. at Natal Herb., March 1935, *H. M. L. Forbes* 1243 (Natal Herb. Durban) ; Durban, cult. at Natal Herb., May 1939. *Schweickerdt and Ogilvie* in Natal Herb. nos. 29874, 29875, 29876 ; Durban, cult. in Bot. Gard., May 1939, *Schweickherdt and Ogilvie* in Natal Herb. nos. 29877, 29878, 30434.

The plants are caulescent, the stem simple, up to 45 cm. high. I have only examined specimens with stems up to 22·5 cm., but I have it on the authority of Dr. J. Gerstner that at the type locality he has seen them up to 45 cm. He also gives it as his opinion that there is a slight difference between the stems of the male and female plants, those of the former being cylindric and well-defined, while those of the latter tend to be almost globose.

Bracts at the base of the leaves ovate-lanceolate, up to 4 cm. long and 1·25 cm. wide at the base, glabrous on the inner surface, and lanate on the abaxial surface. Leaves up to 1 m. long, rhachis glabrous, not grooved on the upper surface, sometimes produced about 1·25 cm. beyond the terminal leaflets. Leaflets glabrous, about 25 pairs, not quite in one plane, the lower edge of the extremity of the leaflet being slightly curved upwards ; oblong-elliptic, sessile, broad- and unequal-based, the upper side almost cordate, the lower almost at right angles to the rhachis ; without a definite apex, but divided into 3–5 broadly triangular pungent-pointed lobes ; margin firm, recurved, with 3–4 smaller lateral teeth on upper margin, and 0–3 on lower margin, the number on the lower margin being reduced towards the base of the leaf. Leaflets crowded, overlapping slightly, the longest at the middle of the rhachis where they are 16 cm. long and 6 cm. broad, decreasing towards the base of the leaf to 9 cm. long and 4 cm. wide. The lowest 2–4 pairs of leaflets are very much reduced. The upper surface is dark olive green, the lower much lighter, and in the larger leaflets shows 40–50 quite distinct parallel nerves.

There appears to be quite considerable variation in the number of teeth on the leaflets in different plants, but this can in no way be correlated with the sex of the plant. The apical pair of leaflets are usually unequal in size, from 5–7 cm. long and 2–2·5 cm. wide, the apex consisting of 2 triangular pungent-pointed lobes, and the upper margin bearing 1–2 teeth, the lower 1-toothed or entire. In some cases however, both margins are entire and the apex simple and pungent, while in others, where the rhachis is not produced beyond the leaflets, the terminal pair are very much reduced, entire, narrowly lanceolate and pungent-pointed, only about 4 cm. long and 0·6 cm. wide. In most plants the older leaves, those first produced, bear apical leaflets strongly toothed like those at the centre of the leaf ; also in these leaves, and in the younger,

PLATE IV

1. Male cones of *Encephalartos kosiensis* Hutch. The collapsed cone in the centre was produced the previous season. The spotted appearance of the leaves is due to spraying with lead arsenate.

2. Female cone of *E. kosiensis* Hutch.

[*To face page* 656.

not fully developed ones, the cordate side of the leaflet bases is inclined to overlap the rhachis.

Male cones 1–2 in plants seen, pedunculate, orange-brown, cylindric, tapering slightly at both ends, 39cm. high and 9–10 cm. in diameter; peduncle 12 cm. long, pubescent at least towards the base. Scales glabrous, obovate, with a rhomboid slightly rugose top, 2·5–3 cm. across and 1–1·5 cm. high, the top rising slightly towards the lower surface to an irregularly rhomboid flat, smooth area about 1–1·5 cm. across and 0·75–1 cm. high.

Female cone pedunculate, solitary in the plant examined, but Aitken and Gale (Bot. Survey S. Afr., Mem. 2, p. 13) mention a plant of this species "bearing two fine brilliant red cones"; cone ovoid, rather flattened at the apex, bright tangerine, turning yellow on maturity, 27 cm. high and 19–20 cm. in diameter; peduncle cream, glabrous, about 7·5–10 cm. long. Scales glabrous, very rugose, almost echinate, on the upper and lower (unexposed) surfaces, arranged in 8–10 spirals, the largest at the base. The top is rhomboid, slightly rugose in the upper portion, from 3·5–5·5 cm. across, and 2·5–3·5 cm. high; towards the lower surface it rises to a small irregularly rhomboid slightly convex, smooth area, 1·5–2·5 cm. across and 1–1·25 cm. high. The seeds are tangerine-coloured, oblong, rounded at the top and tapering slightly towards the truncate micropylar end, roughly three-angled, 4·5 cm. long, 1·5 cm. in diameter.

A mass of root tubercles, apparently caused by bacterial infection, was found on one of the youngest plants examined.

I have not seen *E. kosiensis* growing in its natural habitat, but Aitken and Gale (l.c. p. 13) describe it as growing "just back of the sand-dune bush," and "within the bush itself." It seems therefore to occur much nearer the coast than any other South African species, though the East African *E. Hildebrandtii* is described in a letter from Sir John Kirk (Kew Bull. 1914, 388), as growing right on the rocky shore.

LXVII—NOTES ON CAREX: XI.* E. Nelmes.

New Siamese Species.

The preparation of the genus *Carex* for the "Florae Siamensis Enumeratio" has disclosed three species which are considered to be new. They are described below.

The first, *Carex craspedotricha*, is represented at Kew by better material from China, and this has accordingly been chosen as the type.

Carex craspedotricha *Nelmes*, sp. nov.; affinis *C. planatae* Franch. et Sav., sed inflorescentia longiore, spiculis pluribus, utriculis minoribus minus late alatis differt.

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* Continued from K.B. 1939, 313.

Rhizoma caespitosum. *Culmi* usque 50–70 cm. alti, laeves, graciles, foliati, basi vaginis dissolutis brunneis cincti. *Folia* superiora interdum inflorescentiam superantia, 2–4 mm. lata, planiuscula, mollia. *Inflorescentia* 9–12 cm. longa. *Spicae* 12–16, gynaecandrae, ovoideo-ellipticae vel subglobosae, sessiles, plerumque 5–10 mm. longae, subapproximatae, infima remotiuscula. *Bracteae* inferiores foliaceae, inflorescentiam superantes, superiores squamiformes, omnes evaginantes. *Squamae* ovatae, acutae, albidae, carinatae, mucronulatae. *Utriculi* squamis longiores latioresque, circiter 3 mm. longi, elliptici vel ovato-elliptici, suberecti, tenuiter membranacei, glabri, compresse concavo-convexi, marginibus superne alati. et scabro-ciliati, dorso 4–5-, ventre 2–3-nervati, vix stipitati, in rostrum mediocre scabro-ciliatum bidentulum subsensim abeuntes. *Stigmata* 2.

China. Kwangtung; Yingtak-hsien, Tutcher's North River Expedition, April, 1914, Hongkong Herb. No. 10,643 (type, Kew).

Siam. Mûang Fang, Doi Pahom Pok, c. 1600 m., in open ground, 2 April 1921, *Kerr* 5184 (Kew); Mûang Chêm, Doi Ngao, c. 1300 m., in moist ground by stream, 12 May 1921, *Kerr* 5429 (Kew).

Carex lageniformis *Nelmes*, sp. nov.; affinis *C. graniferae* Dunn, sed utriculis minoribus rhomboidali-lageniformibus distincte multinervosis praecipue differt.

Rhizoma obliquum, crassum, caespitosum. *Culmus* lateralis, 3–6 cm. altus, gracilis, saepe curvulus, laevis, vaginis breviter laminiferis obsitus. *Folia* sterilia culmum longissime superantes, 4–7 mm. lata, plana, superne marginibus aspera. *Spicae* 3–5, fastigiatae, corymboso-capitatae, suprema mascula, parva, pauciflora, ceterae femineae, usque 1 cm. longae, suberectae, subdensiflorae, plerumque breviter incluse pedunculatae. *Bracteae* inferiores subfoliaceae, inflorescentiam superantes, vaginantes, superiores abrupte minores. *Squamae femineae* oblongo-lanceolatae, pallidae, carinatae, apice acutae. *Utriculi* squamas duplo superantes, 5 mm. longi, membranacei, rhomboidali-lageniformes, subinflati, obtuse trigoni, multinerves, subpatentes, minute puberuli, breviter sed valde stipitati, in rostrum mediocre conicum ore albidum bidentulum sensim abeuntes. *Nux* subarcte inclusa, rhomboidalis, trigona, lateribus inferne et superne concavis, longe et valde stipitata, in rostrum breve cylindricum apice disciforme abrupte contracta. *Stigmata* 3.

Siam. Chantabūn, Kao Soi Dāo, c. 1400 m., in evergreen forest, 13 December 1924, *Kerr* 9647 (Kew).

Carex sychnostachya *Nelmes*, sp. nov.; affinis *C. Helferi* Boeck., sed paniculis secundariis minoribus paucioribus, utriculis brevioribus ellipticis praecipue differt.

Rhizoma lignosum, stoloniferum. *Culmi* circiter 40 cm. longi, validi, scabridi, parce foliati, basi foliis paucis et vaginis aphyllis

fuscis circumdati. *Folia* culmum subaequantia, 1–2 cm. lata, plerumque plana sed inferne conduplicata, coriacea, inferne marginibus et supra nervis prominentibus scabrida. *Inflorescentia* valde paniculata, interrupta; *paniculae secundariae* 4–5, singulae, ovato-pyramidales, densae, circiter 2 cm. longae, circiter 1–1·5 cm. latae, inferiores distantes, infima longe exserte pedunculata; pedunculi scabridi. *Bracteae* inferiores subfoliaceae, inflorescentiam subaequantes, longe vaginantes, superiores vaginiformes. *Spicae* androgynaeceae (pars mascula parti femineae subaequilonga), paucae, 8–10 mm. longae, demum divaricatae. *Squamae femineae* oblongo-ovatae, albidae, carinatae, mucronatae. *Utriculi* squamas superantes, 4–4·5 mm. longi, demum divaricati, late elliptici, conspicue trigoni, hirtelli, plurinerves, in rostrum longum marginibus hispidulum oblique sectum bidentatum (dentibus strictis) sensim attenuati. *Stylus* basi incrassatus. *Stigmata* 3.

SIAM. Petchabūn, c. 200 m., on bank of dry stream in evergreen forest, 28 March 1922, *Kerr* 5703 (Kew).

A new name is here given to the species described by Boott as *C. tumida*, which is a later homonym:

Carex oedorrhampha *Nelmes*, nom. nov. *C. tumida* Boott, Illustr. **1,** 66 (1858), non Beilschm. (1850).

LXVIII—NEW OR LITTLE-KNOWN PLANTS FROM SOUTHERN INDIA: XI.*

Myriactis glutinosa *Schlecht.* [Compositae].

This combination, published in Linnea, **25,** 207 (1852) has been overlooked in subsequent works, including C. B. Clarke, Comp. Ind. and F. Brit. India, presumably because the Index Kewensis had not been published when they were compiled. Schlechtendal described the species from plants grown from seed sent to him from the Nilgiri Hills by the Rev. B. Schmid. The description agrees well with *M. Wightii* DC. in Wight, Contrib. 10 published in 1834, so that the omission is of no consequence.

Barleria Morrisiana *E. Barnes* et *C. E. C. Fischer*, sp. nov. [Acanthaceae]; *B. pilosae* Wall. et *B. Lawii* T. And. accedens, ab illa sepalis exterioribus majoribus late ovatis, ab hac floribus solitariis, sepalis exterioribus late ovatis, ab utraque, statura multo minore, foliis anguste oblanceolatis usque ellipticis fere glabris differt.

A perennial *undershrub* up to 23 cm. high; roots numerous, wiry; stems numerous from a thickened stock, woody, slender, terete, dark-red, dark-brown or black when dry, sparingly adpressed-hispidulous. *Leaves* narrowly oblong to elliptic or oblanceolate, narrowed at both ends, acute or subacute, 3–6 cm. long, 0·8–2·2 cm. wide, midrib reddish, raised below, primary nerves 4–5 pairs,

* Continued from K.B. 1939, 251.

anastomosing near the entire, red margins with coarse reticulation between, sparsely appressed-hispid on the nerves and edges, dull-green above, pale silvery-green below, when dry dark-olivaceous above, pale below; petioles 1–3 mm. long. *Flowers* axillary, solitary; pedicels 4–8 mm. long, appressed-hispid; bracteoles a little above the middle of the pedicels, linear to linear-lanceolate, acuminate, sometimes rigid and pungent, 8–10 mm. long, hispid-ciliate. *Sepals* 4; outer pair broadly ovate, the anterior frequently shortly bifid with acute lobes, 1·9–2·4 cm. long and 1–1·4 cm. wide in flower, up to 3 cm. long and 2 cm. wide in fruit, glabrous or sparsely hispidulous on the 9 nerves outside, minutely spinulose-ciliate, reddish-brown or green or green flushed brown; inner pair linear-lanceolate, acuminate, 8–9 mm. long, hispidulous, greenish. *Corolla* tubular funnel-shaped; tube white, 2–2·5 cm. long, slightly constricted about $\frac{1}{3}$ above the base and then expanding to double the basal diameter at the mouth, sparsely hairy within at the constriction; lobes 5, spreading, obovate to rotund-obovate, usually emarginate, 1·2–1·5 cm. long, up to 1·4 cm. wide, pinkish-mauve, usually with a few hairs on the margins at the base. *Stamens* 5, all fertile, inserted at the constriction of the corolla-tube; filaments slender, sparsely hairy at the base, one distinctly shorter than the remaining 4 of which 1 pair is slightly longer than the other 2; anthers linear-oblong, 3–3·5 mm. long, of the 5th stamen a little shorter, those of the 4 long stamens exserted; pollen grains orbicular, smooth. *Ovary* ovoid, 2 mm. long, glabrous; ovules 4; style longer than the stamens, white; stigma large, clavate-capitate, flattened or concave at the apex, mauve. *Capsule* ovate-ellipsoid, hollow throughout, 1·7 cm. long, nearly black. *Seeds* broadly ovate, or subcircular, flat, 6–7 mm. long, brown, densely covered with white silky, hygroscopic hairs up to 1 cm. long.

Mysore State: Billigirirangan Hills near Punjur, 900–1100 m., frequent on dry stony hills, fls. April–May, frt. April–June and later, *E. Barnes* 2122, 2155 (type, in Kew Herb.) 2166 (fruit). Growing with *Meyenia Hawtayneana* Nees. The specific name commemorates Mr. Randolf Morris, planter in the Billigirirangan Hills, who is a noted hunter of big game and a keen naturalist.

Pancratium parvum *Dalz.* [Amaryllidaceae].

This species was described from a plant found in the Thana District of the Bombay Presidency. Subsequently it was obtained in a few other localities of that Presidency, and Cooke, when writing his Flora of that region, considered that it was probably endemic. It had, however, been collected in the Bababudan Hills and so was included in the "Flora of the Presidency of Madras." Professor Barnes has now found it in the Billigirirangan Hills. The previous descriptions state that the filaments are hardly longer than the teeth of the cup (staminal) but no measurements are given and the following taken from Prof. Barnes' excellent specimens may be useful.

Bulb 3–4 cm. diam. Outer segments of *perianth* up to 3·5 cm. long and 7 mm. wide, apiculate with a tubercle a little below the apex; inner segments 2·8–2·9 cm. long, tunicate or rounded and slightly cucullate at the apex with a minute apiculum and no tubercle. Teeth of *corona* 2·7 mm. long, 2 mm. wide; *filaments* 1 mm. long; *anthers* 9 mm. long.

Mysore State: Billigirirangan Hills, common, fls. in latter half of April, *E. Barnes* 2123 and 2171 (in spirit).

Amorphophallus mysorensis *E. Barnes et C. E. C. Fischer* sp. nov. [Araceae]; *A. silvatico* (Roxb.) Kunth. affinis, sed planta major, segmento mediano foliorum dichotomo, petiolis olivaceis et nigro-maculatis, foliolis linearibus vel lineari-lanceolatis, spatha majore purpurea, organis neutris 1–3-seriatis globosis, appendice breviore purpurea differt.

Tuber depressed-globose, up to 10 cm. diam., white. *Cataphyll* solitary, lorate, cuspidate, about ⅓ as long as the petiole, pink when young, becoming brown and scarious. *Leaf* solitary; petiole up to 44 cm. long, terete, beautifully mottled dark-olive-green and blackish on a light-green ground, whitish or pinkish at the base; blade broadly oblate in outline, up to 43 cm. wide and half as long, trisect, all three branches dichotomously branching, the 2 lateral broader than the median, pinnatisect into opposite or alternate linear to linear-lanceolate, acute segments decurrent on the rhachis, 2·5–10 cm. long, the apical the longest, 5–12 mm. wide, a few basal ones reduced to oblong, obtuse, auricles, lateral nerves 4–5 pairs, uniting in a sub-marginal one, impressed above, raised below, glabrous on both faces, glaucous-green above, paler below. *Peduncle* slender, terete, up to 41 cm. long, mottled olive and pale-green, smooth. *Spathe* rotund-ovate, deeply convolute, acute, 7–13 cm. long, dull bleached-purple or dull greenish without with numerous, fine, raised, parallel veins, purple and glossy within, darker at the centre. *Spadix* slender, thickening later, up to 19 cm. long; stipe up to 8 mm. long; ♀ inflorescence terete, up to 2·5 cm. long; neuters covering about 1 cm., ♂ flowers extending up to 6·5 cm. long; appendix up to 8 cm. long. ♀ *flowers* crowded; ovaries spherical, up to 2·5 mm. diam., yellowish-green, 2-celled, ovule 1 in each cell, attached to the middle of the dissepiment; style very short, stigma almost spherical or more or less 2-lobed, a little smaller than the ovary, white becoming buff, sticky and somewhat tubercled. *Neuters* crowded in 1–3 rows, spherical, up to 7 mm. long, brownish-red and glossy, becoming buff-coloured and spongy. ♂ *flowers* very numerous, crowded, subglobose, laterally compressed, yellow flushed with red, 4-celled, opening by 2 apical pores. *Appendix* subulate, dark-purplish or chocolate, corrugated at the base, smooth and subglossy above, becoming warty and wrinkled with age. *Berries* ovoid, apex indented, up to 1·2 cm. long, scarlet. *Seeds* 1–2, ovoid or subglobose, 7–8 mm. long, whitish at the base,

the blunt conical tip green, testa dark-grey covered with a thin silvery outer skin that breaks up into scales when dry.

MYSORE: Billigirirangan Hills, Western slopes, 3rd mile on Punjur Ghat in stony ground under shade of bamboos, 1260 m., fls. April, *E. Barnes* 2133 (Type in Kew Herb.); 2159 (leaf-blade); June, 2159A (petiole, peduncle and fruiting spadix); June, 2167 (inflorescence in spirits). Notes by Prof. Barnes:

The inflorescence appears before the leaf and the ♀ flowers mature earlier than the ♂ on the same spadix. As leaves of several sizes are found, it appears that a tuber produces a leaf each year for several years before an inflorescence is produced, and thereafter the tuber does not produce a leaf for some time, probably not the same season. Some leaves of immature plants had fewer and broader lobes than is characteristic of the full-sized ones.

LXIX—A NEW SPECIES OF YOUNGIA AND ITS BEARING ON THE DISTRIBUTION AND PHYLOGENY OF CERTAIN SPECIES. E. B. BABCOCK (University of California.)

In their monograph on *Youngia*, Babcock and Stebbins (Carnegie Institution of Washington, Publ. No. 484, p. 59) state that the geographic distribution of *Y. cinereipappa*, *Y. gracilis* and *Y. fuscipappa* supports the idea (suggested by differences in size of plant and caudical leaves) that *cinereipappa* is more primitive than the other two species, since its area in southwest China, Indo-China, and Assam is central with reference to the range of the genus, whereas the other two are at the outskirts of the range—*gracilis* in the Sikkim Himalayas and *fuscipappa* in Ceylon. It is also noted (op. cit. 62) that a typical fragment of *cinereipappa* was reported to have been collected in the highlands of Ceylon; also (p. 63) that, if its existence in Ceylon should be verified, this will strengthen the hypothesis that this species is either the ancestor of the other two or represents a common progenital stock. Although no further evidence is at hand concerning the existence of *Y. cinereipappa* in Ceylon, yet some additional evidence, having a bearing on this problem, has been found in the existence of a new Indian species in the Nilgiris area of southern Mysore.

Youngia nilgiriensis *Babcock*, sp. nov.; affinis *Y. gracili* Hook. f., a qua caudicis foliis majoribus et lyratis, involucri bracteis exterioribus longioribus, corolla longiore, ligularum dentibus longioribus, antherarum tubo appendicibusque brevioribus et praesertim achaeniis longioribus brunneis basin versus haud attenuatis, pappo copiosiore differt.

Herba perennis, 3–4·7 dm. alta. *Caudex* brevis, ligneus. *Folia caudicalia* 10–16 cm. longa, 1·5–3 cm. lata, oblanceolata, acuta, lyrata, pinnatifida, in petiolum longum sensim angustata, supra puberula, infra glabra, segmento terminali triangulato truncato sinuato, segmentis lateralibus rotundis vel triangularibus. *Folia*

caulina inferiora similia vel acuminata, superiora sessilia, lanceolata, acuminato-caudata. *Caulis* tenuis, sinuatus, teres, glaber vel nodis tomentulosus, ramis brevibus vel longis capitula 2–4 gerentibus. *Pedunculi* 1–5 cm. longi, glabri. *Capitula* parvula, circiter 13-flora. *Involucra* 8–9 mm. longa, nigro-viridia, glabra, squamis exterioribus 5–7 inaequalibus 2–3·5 mm. longis, squamis interioribus 8 per vices apice tuberculatis maturitate basi carinatis et spongioso-incrassatis. *Receptaculum* areolatum, nudum. *Flosculi* flavi. *Corolla* 9–10 mm. longa, ligula 2 mm. lata, dentibus 1–1·5 mm. longis, tubo 2 mm. longo breviter pubescente. *Antherae* 2 mm. longae, appendiculis 0·25 mm. longis acuminatis, filamentis 1 mm. longioribus. *Styli rami* virides, 1 mm. longi. *Achaenia* fusca, 5 mm. longa, subcompressa, apice pallida et valde attenuata, basi vix attenuata, costis 12–14 inaequalibus spiculatis. *Pappus* cyaneo-griseus, 5 mm. longus, 2–3-seriatus, subcrassus, persistens.

India : Madras, southern Mysore, Nilgiris area, Sispara, 2060 m., fl. Nov., *J. S. Gamble* 13341 (typus in Herb. Kew.).

Although this plant exhibits much general resemblance to *Y. gracilis* Hook. f., yet it differs in many details, most notably in the larger, lyrate, caudical leaves, the longer outer involucral bracts, the longer corolla and ligule-teeth, the shorter anther-tube and appendages, and especially *in the longer, brown achenes which are not attenuate to the base*, and in the more copious pappus.

Y. nilgiriensis is intermediate between *Y. gracilis* and *Y. cinereipappa* in size of plant and leaves ; but it is distinct from both these species, as well as from *Y. fuscipappa*, in the character of leaf dissection and especially in the larger corollas and achenes, as well as the 2–3-seriate pappus. These features of the flowers and fruits, together with the lyrate caudical leaves, characterize *Y. nilgiriensis* as somewhat more primitive than the other three species in this subsection of the genus. Its occurrence in an isolated highland suggests that it may be an endemic relict ; and, in view of its diagnostic characters, that it, rather than *cinereipappa*, may more nearly represent the ancestral type from which this group arose. Further collections in the Nilgiri highlands would be of interest. It is also very desirable that the Cardamom-Palni Hills region, which is farther south and reaches a still higher elevation, should be explored for *Youngia*. In fact this is the only other highland of comparable elevation south of the Himalayas. The attention of Indian botanists to this interesting group of species is invited.

LXX—NEW PLANTS FROM BHUTAN AND TIBET.

C. E. C. Fischer.

Mr. B. J. Gould, I.C.S., Government Agent in Sikkim, took the opportunity afforded by his official tours in Sikkim, Bhutan and Tibet to make collections of plants, totalling up to date about

2400 numbers, which have been presented to the Kew Herbarium. Among these are the following new species and one new variety.

Saxifraga Gouldii *C. E. C. Fischer*, sp. nov. [Saxifragaceae]; ab *S. brachypoda* Don et *S. fimbriata* Wall. gemmis nullis, floribus majoribus, petalis glanduloso-ciliatis separatis; ab *S. megalantha* Marq. in Journ. Linn. Soc. Bot. **48,** 179 (1929) foliis angustioribus basi subcordatis, pedunculis longioribus 2–3- raro 1-floriferis, petalis brevioribus haud unguiculatis differt.

A *herb* (caespitose? the root system is lacking); stems up to 26 cm. long, slender, glabrous except for the gland-hairy apical 2–3 cm., the basal 2–5 cm. almost naked but for the remnants of fallen leaves, the rest leafy. *Leaves* alternate, close, broadly ensiform, acute, pungent, base subcordate, 6–15 mm. long, 2–3 mm. wide, those of the mid-stem longer than the rest, margins spinulose, the spinules of several of the upper leaves gland-tipped, nerves 3, obscure, the 2 lateral nearly parallel to the mid-rib and joining it just below the tip, upper surface, bright green, lower pale-green with a silvery sheen (at least when dry). *Peduncles* and pedicels purplish gland-hairy, the former 6–12 mm. long, the latter 3–5 mm. long; bracts and bracteoles like the leaves but smaller. *Flowers* usually 2, sometimes 3, rarely 1. *Sepals* 5, ovate, obtuse, 5 mm. long, covered outside with purplish short, gland-tipped hairs and closely ciliate with similar ones, glabrous within. *Petals* 4, yellow, obovate, tapering to the base, 8 mm. long 6–7 mm. wide near the subtruncate apex, 1 mm. wide at the base, the apical margins decorated with a single row of small, sessile or shortly stipitate black glands which are continued for a varying distance along the sides, but not below the middle. *Stamens* 10, 4–4·5 mm. long; filaments narrowly ensiform; anthers oblong, 1–1·2 mm. long. *Ovary* ovoid, trigonous, 3 mm. long; styles 1·3 mm. long. *Fruit* and *seeds* not seen.

Bhutan: Chira, 5100 m. fls. Aug. *Gould* 1310 (type in Kew (Herb.).

Tibet: Gautsa to Phari, 4300–5200 m. fls. Aug. *Gould*, 1467; Dotha, 3700 m., fls. May, *Rohmoo Lepcha* 177, as to 2 of the plants on the sheet, the rest being *S. fimbriata* Wall. (These are the two plants referred to by Marquand (l.c.) under his description of *S. magalantha*.)

In Pflanzenreich, iv, **117** (Saxifrag.) 136, *S. brachypoda* Don is described as having the margins of the petals glandulose-ciliate, but Don in the original description in Trans. Linn. Soc. **13,** 378 makes no mention of such glands, nor can I find any in the Wallich sheets in the Kew Herbarium, Nos. 442 and 443 (*S. fimbriata*), the numbers quoted in Pflanzenreich. Don states that the stems are "pilis undique tecti," but in the Wallich specimens referred to above they are glabrous though at first sight the basal spinules of the leaves appear to rise from the stem. Don, however, quotes the Wallich specimens in the Lambert Herbarium and these seem to have disappeared.

Ceropegia Dorjei *C. E. C. Fischer*, sp. nov. [Asclepiadaceae]; *C. intermediae* Wight similis, sed foliis ovatis basi rotundatis supra hispidulis, petiolis hispidulis, corollis validius inflatis collis brevioribus differt.

A slender *twiner*; stem terete, brown, glabrous or nearly so. *Leaves* elliptic- to broadly-ovate, acute, base rounded, 2–4 cm. long, 1·2–2·8 cm. wide, sparingly pubescent below when young, later glabrous except for scattered short bristly hairs on the midrib, with minute distant bristles above, lateral nerves 3–4 pairs, rather indistinct, inarching near the minutely ciliolate margins, ultimate reticulation very fine; petioles flat (when dry), 4–10 mm. long, hispidulous. *Inflorescence* an axillary, few-flowered umbel, sometimes reduced to a single flower; peduncle rather stout, 1–1·5 cm. long, with a line of pubescence on one side; pedicels up to 1·2 cm. long glabrous; bracts and bracteoles very short, linear, acute. *Sepals* narrowly ensiform acute, apiculate, 5–7 mm. long, eglandular. *Corolla-tube* barrel-shaped, 2–2·2 cm. long, 1·06 cm. diam., abruptly narrowed above into a short cylindrical part 3·3 mm. diam. at the mouth; segments linear-lanceolate, adhering by their apices, in bud forming a narrow, blunt cone. *Corona* crateriform, 3 mm. long, mouth shallowly 10-lobed with 5 ligulate processes 0·5 mm. long, cohering at the base to the anthers. *Fruit* not seen.

Bhutan: Trongsa to Tsanka, 2600–2700 m., fls. June, *Gould* 639 (Type in Kew Herb.). The colours of the corolla are not given but the tube appears to be pale-yellow with the mouth and lobes dark. The species is named in honour of the Raja Dorje, who was one of the Bhutanese chiefs who gave assistance to Mr. Gould.

Ceropegia Ugeni *C. E. C. Fischer*, sp. nov. [Asclepiadaceae]; *C. lucidae* Wall. similis, sed foliis caudato-acuminatis, petiolis hispidis, pedunculis secus alterum latus linea pubescente instructis, bucca corollae truncata evoluta, lobis eciliatis distat.

A twining *shrub*; stem slender, terete, brown, sparsely puberulous especially at and near the nodes, internodes much longer than the leaves. *Leaves* broadly elliptic, caudate-acuminate, base cuneate, 7–11·5 cm. long, 4–5·5 cm. wide, sparsely pubescent below when young, later glabrous except for a few short hairs on the midrib at the base below, distantly dotted above with very short, stout bristles, margins minutely ciliolate, lateral nerves 5–6 pairs, nearly straight, inarching near the margins, ultimate reticulations minute; petioles 1·2–1·7 cm. long, hispid. *Peduncles* axillary, 6–10 mm. long, pubescent on one side, solitary, bearing an umbel of 8 to 12 or more flowers, or sometimes produced into a subumbellate cyme, sometimes a more slender peduncle bearing one abortive flower is found alongside the fertile one; pedicels up to 2 cm. long, glabrous; bracts and bracteoles like the sepals, 2–3 mm. long. *Sepals* free or nearly so, linear to narrowly ensiform, sharply acute, recurved, 6–7 mm. long, glabrous, bearing minute triangular glands at the base within. *Corolla* narrow, elongate urn-shaped; tube up to

2·5 cm. long, 6 mm. diam. at the widest part, narrowed to 3·5 mm. above and thence expanding to 5½ mm. at the truncate mouth, everted in the open flower, lobes linear, 8–9 mm. long, adhering by the tips in the open flower, forming a beak in bud. *Corona* annular bearing 5 linear, obtuse horns 3 mm. long. *Fruit* not seen.

Bhutan: Ri-Tang to Tsarza-La, 3000–3300 mm., fls. July, *Gould* 761 (Type in Kew Herb.). The colours of the corolla have not been stated; the tube appears to be pale with the numerous veins darker and the mouth and segments darker still. The material is scanty; the measurements may have a larger range. The specific name commemorates Ugen, son and heir of the Maharaja of Bhutan.

Briggsia Penlopi *C. E. C. Fischer*, sp. nov. [Gesneriaceae]; *B. muscicolae* (Diels) Craib affinis, foliis minoribus marginibus crenatis, petiolis longis, scapis floribusque brevioribus, sepalis eglandulosis differt.

A scapigerous *herb*. *Leaves* elliptic or elliptic-oblong, obtuse, narrowed to an obtuse base, 5·5–7·5 cm. long, 2–3 cm. wide, margins coarsely crenate, both sides densely covered with appressed pale hairs, often brownish on the nerves below, dark above, paler below, lateral nerves 6–7 pairs, nearly straight, their branches running into the marginal sinuses, secondary nerves invisible; petioles compressed, 2–5 cm. long, covered with short white hairs intermixed with long, multicellular, spreading brown ones. *Scapes* slender, 9–13 cm. long, patently brown-hairy, few flowered; bracts narrowly lanceolate, up to 5 mm. long, white and brown hairy; pedicels up to 7 mm. long, clothed with spreading, multicellular, brown hairs or sometimes white in the lower part. *Calyx* of 5 linear, subacute, almost free segments 6–8 mm. long, sparsely clothed with multicellular brown hairs. *Corolla* tubular-funnel-shaped, posteriorly slightly gibbous above the middle, 2–2·3 cm. long, sparsely hairy without, 2 lipped, anterior lip 5 mm. long, with 3 subequal oblong lobes, white-hairy within; posterior lip slightly shorter, 2 lobed. *Stamens* 4 inserted about the middle of the corolla tube, included; filaments glabrous, posterior pair nearly straight 5·7 mm. long, anterior strongly curved, 9 mm. long. *Disk* annular, 1 mm. long. *Ovary* linear-oblong, compressed, 8 mm. long, glabrous except for a few gland-tipped hairs at the apex; style rather stout, 4 mm. long. stigma narrowly clavate. *Capsule* not seen.

Bhutan: Pele-La to Ri-Tang, 400–300 m., fls. June; *Gould* 718 (type in Kew Herb.). The corolla appears to be yellow. Named after the Paro Penlop, Ruler of Paro under the Maharaja.

LXXI—SOLANUM HISPIDUM PERS.: ITS DISTRIBUTION AND SYNONYMY.

C. T. White.

For some years past I have been puzzled over the correct identification of a tall, robust and handsome *Solanum* that is naturalised but not especially abundant about Brisbane (Queensland). It was probably introduced as a garden shrub, but I have

not noticed it in any Australian garden of recent years. The plant was evidently in cultivation at the Brisbane Botanic Gardens in 1882, as there is an herbarium specimen at Kew from Cape Town (South Africa) collected by P. MacOwan and accompanied by the following note : " I have not been able to identify this. It was raised from a stray seed picked out from among a collection from Queensland Botanic Gardens or Adelaide (uncertain which) in 1882. The plant is now a 10 ft. tree and flowers and seeds profusely in the Cape Town Municipal Garden." About Brisbane it is mainly found on creek banks in open forest or cleared light rain-forest, but is sometimes seen on vacant allotments around the town.

It had been determined as *Solanum torvum* Sw. (*sensu lato*), but is quite different from the ordinary form of that species which is a very abundant weed in Queensland and is mostly known as " devil's fig," sometimes as " Dirran curse," though in a more limited sense the latter name belongs to a native species, *S. hamulosum* C. T. White. The *Solanum* concerned was collected by Mr. C. E. Hubbard during his 12 months stay in Queensland, and was distributed as *Solanum torvum* Sw., under No. 3156 (Ferny Grove nr. Brisbane, in sparse rain-forest near stream. Erect shrub, up to 10 ft. high, reddish brown hairs on branches, young leaves and midrib, leaves green, corolla white, flowers and fruits, 28/6/1930). When sending me further specimens of the plant recently, one of my assistants, Mr. L. S. Smith, suggested it might be *Solanum Warscewiczii* Hort., a species that at one time, judging from the illustrations cited in the Index Londinensis, was fairly common in European gardens. All the illustrations cited show the habit of the plant very well, though none shows flowers and fruits or details of the same. In the Kew Herbarium there is a specimen from a plant cultivated in the Temperate House, though the species has now disappeared from the living collections at Kew. This specimen exactly matches the Queensland material. The various specimens, however, suggested so much the appearance of the " *torvum* " group from tropical America, that a search was made among the Central American specimens in the Herbarium ; and the plant was found to be *Solanum hispidum* Pers., a common Mexican species.

In addition to the American and Australian specimens at Kew is one from India and another from Algeria (both cultivated) ; and Alston in the Handbook to the Flora of Ceylon, **6** (Suppt.), 207 (1931) records the species as an escape around Hakgala. Ruiz and Pavon in their original account of the species (as *Solanum stellatum*), gave the native country as Peru, but there are no Peruvian specimens at Kew, and Standley in his " Trees and Shrubs of Mexico " (Contrib. U.S. Nat. Herb. **23,** 1300 : 1924) queries its occurrence in that country and gives it as a native of Mexico and Guatemala. In 1907 De Wildeman described and figured a *Solanum* from the Belgian Congo as a new species, *S. Pynaertii*. I have not seen a specimen, but his description and illustration tally so exactly with

S. hispidum Pers. that I have no hesitation in referring it to this species, which is evidently naturalized in the Congo.

A characteristic feature of *S. hispidum* Pers. is the peculiar rust-coloured indumentum composed of long-stalked stellate hairs, which are admirably illustrated in De Wildeman's figure and in a cruder way by Ruiz and Pavon (both cited below).

The following is the synonymy :

Solanum hispidum *Pers.* Syn. Pl. **1,** 228 (1805) ; Dunal in DC. Prodr. **13,** pt. 1, 275 (1852) ; Hemsl. in Biol. Centr.-Amer., Bot. **2,** 409 (1882) ; Standley in Contrib. U.S. Nat. Herb. **23,** 1300 (1924).

S. stellatum Ruiz et Pavon, Fl. Peruv. **2,** 40, t. 176, fig. b. (1799) ; non Jacq. (1789).

S. chrysotrichum Schlecht. in Linnaea, **19,** 304 (1847), sec. Standley, l.c.

S. Warscewiczii Hort. Weich. ex Lambertye in Revue Horticole, 1865, 429, fig. 50.

S. Pynaertii De Wildeman, Mission Émile Laurent, 437 (1907).

LXXII—MISCELLANEOUS NOTES.

Honours List.—Since our note on the New Year's Honours was published in Kew Bulletin, 1939, 31, the following Honours have been conferred, and we have much pleasure in recording them here : Knight Bachelor—Edwin John Butler, Esq., C.M.G., C.I.E., D.Sc., M.B., F.R.S., Secretary to the Committee of the Privy Council for Agricultural Research and Secretary to the Agricultural Research Council. C.B.E.—Charles Edward Legat, Esq., Secretary, Empire Forestry Association ; John Phillips Mead, Esq., Director of Forestry, Straits Settlements ; Edward James Salisbury, D.Sc., F.R.S., Quain Professor of Botany, University of London.

Promotions in the Colonial Agricultural Service.—Mr. D. L. Blunt, M.A., has been appointed Director of Agriculture, Kenya. Mr. Blunt was formerly an agricultural officer in that colony (1926–33), but in 1933 was transferred to Cyprus as Director of Agriculture and after four years moved to Nyasaland in the same capacity.

Mr. H. P. Waters, B.A., has been appointed Director of Agriculture, Gold Coast, in the vacancy caused by the retirement of Mr. G. C. Auchinleck. Mr. Waters has spent most of his service on the West Coast. He was appointed Superintendent of Agriculture, Nigeria, in 1921, and served in that colony until 1928 when he was transferred to the Gold Coast as Deputy Director. He was appointed Director of Agriculture, Kenya, in 1933, and so returns to the West Coast after an absence of six years.

Dr. I. B. Pole-Evans.—We regret to learn that Dr. Pole-Evans, C.M.G., M.A., D.Sc., F.L.S., Chief of the Division of Plant Industry, Department of Agriculture and Forestry, Union of South Africa, has recently retired under the age limit. Dr. Pole-Evans was educated at the University College of South Wales and Monmouthshire, and Cambridge University, where he was a member of Selwyn College and carried on research work on Fungi under the late Professor H. Marshall Ward. He was appointed Mycologist to the Transvaal Government in 1905 and was promoted to be Chief of the Division of Plant Pathology and Mycology in the Department of Agriculture, Union of South Africa, in 1911, and in 1927 he became Chief of the Division of Botany, Plant Pathology, Horticulture and Entomology. In 1929 his post was styled Chief of the Division of Plant Industry. In 1918 he was appointed Director of the Botanical Survey of South Africa.

Dr. Pole-Evans has travelled widely in the Union of South Africa, and his work on the pasture grasses has been of great value in connexion with erosion and over-grazing problems in the Union. He has also rendered very valuable service in matters relating to the South African fruit trade in connexion with fungous diseases and cold storage problems. In 1919 he was President of the South African Association for the Advancement of Science.

Dr. Pole-Evans has our best wishes for many years of continued botanical activity during his retirement.

We learn that the Divisions of Plant Industry and Agricultural Education and Extension have been replaced by five new divisions. These are as follows :—Animal and Crop Production ; Soil and Veld Conservation ; Horticulture ; Entomology ; Botany and Plant Pathology.

Dr. E. P. Phillips, M.A., D.Sc., has been appointed Chief of the new Division of Botany and Plant Pathology, and we extend him our best wishes in his new post.

Maurice Armand Bailey.—We regret to record the death of Mr. M. A. Bailey, M.A., Director of the National Institute of Agricultural Botany, which occurred at Cambridge on 16th October, 1939. Educated at Dulwich and Cambridge, where he took the Natural Science Tripos and the Diploma in Agriculture, he afterwards held a Research Studentship at the John Innes Institution from 1911 to 1915. The war intervened and he joined the R.F.A., resigning his commission in 1919 with the rank of Brigade-Major and the award of the M.C.

It is chiefly for his work on cotton, and particularly Egyptian cotton, that Bailey will be remembered. From 1919 to 1938, when he retired, he served with the Egyptian Ministry of Agriculture in Cairo and with the Empire Cotton Growing Corporation in the Sudan. For the last seven years of his foreign service he was Director of Agricultural Research to the Sudan Government.

His service will be remembered for the work he did in combating such cotton maladies as leaf curl by breeding resistant strains, and his organization of research under the peculiar conditions that surround cotton growing in the Gezira.

On his retirement last year, he accepted the post at Cambridge, and even in the short time he was there his personality had instilled renewed life and enthusiasm into the work of the Institute.

His death at the early age of 49 is a real loss to agricultural science.

Henry Halcro Johnston.—We regret to record the death, at Kirkwall, on 18th October, 1939, of Colonel H. H. Johnston, C.B., C.B.E., D.Sc., M.D., D.L., at the age of 83 years.

Col. Johnston is best known to British botanists through his researches on the flora of the Orkneys. On this subject he published many papers in the Annals of Scottish Natural History and in The Transactions of the Botanical Society of Edinburgh. These papers chiefly recorded species, varieties, etc., new to the flora of the Orkney Islands. Many of them were apomicts or paramorphs of species belonging to such polymorphic genera as *Rosa*, *Taraxacum*, and *Hieracium*.

Col. Johnston was a meticulously careful recorder. His specimens were usually adequately collected and well prepared and full notes were provided with them. He was insistent that referees, to whom he frequently submitted specimens, should give their determinations according to his own instructions. Kew is indebted to him for many valuable specimens from Orkney. There are also in the Kew Herbarium collections presented by him from Afghanistan, Egypt, Sierra Leone, Nubia, and Mauritius.

Col. Johnston joined the Army Medical Service in 1881 and was promoted to the rank of Colonel in 1911, retiring from the Service in 1913. During this time he served in the Suakin Expedition and in South Africa, Singapore, Gibraltar and elsewhere, and later in the British Isles.

His valuable Orkney and Shetland collections were bequeathed by him to the Orkney Natural History Society's Museum at Stromness, and his main Mauritius, Indian and S. African collection to the Herbarium of the Royal Botanic Gardens, Edinburgh.

Villa Taranto.—We have received the following notice regarding Captain McEacharn's well-known Garden on Lake Maggiore :—

" In order that the gardens and valuable collection of plants at Villa Taranto shall be preserved for all times, the owner, Captain Neil McEacharn, has offered them, through Signor Mussolini, to the Italian Nation. Il Duce has gratefully accepted the offer and plans are to be drawn up whereby the gardens will form the nucleus for a school and instructional centre where students can be trained in the arts of Horticulture. For the present, there will not be any

important changes in the administration of the gardens, as the gift has been made with the provision that the present owner shall continue to live at the villa for so long as he so desires. Eventually, the villa and gardens will be known as the ' Istituto Botanico di Villa Taranto '."

Mr. H. R. Cocker, who is at present in charge of the Garden, will continue his duties, though with a reduced staff. Mr. Cocker, who left Kew in 1933, has been working in Italy for six years, first with Colonel Beddington at Ospedaletti and later at Villa Taranto. Under his charge Captain McEacharn's Garden has developed rapidly and is now one of the finest in Italy.

An Amazonian Highway.*—To come to the end of a book with much regret that there were not many more pages to be read is a real tribute to its interest. This has been the experience of the reader of Mr. Christopher Sandeman's delightful account of his journey from Lima to Huanucao and then down the Huallaga river from its source, at 14,000 feet in the Peruvian Andes, to Yurimaguas, 500 feet above sea level in the Tropical Amazonian Forests, and thence on foot, muleback and by car, via the old trail, through Moyabamba, Chachapoyas, Cajamarca to Trujillo and back along the Pacific coast to Lima.

The book is in the form of a daily diary and is full of interest from both the geographical and botanical points of view. Mr. Sandeman is a keen gardener with an extensive knowledge of plants which he describes in a way which makes a botanist long to have been with him.

Despite the difficulties of travel on the river by canoe and raft and the arduous journeys up and down the precipitous cuestas on the trail to Cajamarca, Mr. Sandeman not only made notes on the many plants of interest he found in flower, but also made large collections, his bag including a new genus of *Melastomataceae*, which has been named *Sandemania* by Dr. Gleason†, and several new species, which, as well as many of the other plants he collected, have been identified at Kew. The book though in diary form is a very pleasantly written continuous narrative; difficulties and hardships must have been many, but Mr. Sandeman does not let them obtrude in any undue proportion, so that the reader can follow his route and enjoy with him the grandeur of the Huallaga, the thrills of its rapids and deep gorges and the tropical luxuriance of the vegetation on its banks, as well as sympathise with him and his companion in matters of sleeping accommodation and food.

Owing to the depression following the fall in the price of rubber, much of the region traversed has fallen on evil days and poverty and squalor were all too evident.

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* " A Forgotten River," by Christopher Sandeman. London, Oxford University Press, 1939. Pp. xii+299, maps and numerous illustrations. Price 12s. 6d. net.

† See K.B. 1939, 480.

Mr. Sandeman writes with a pleasant vein of humour, which evidently carried him serenely through many difficulties and hardships, and he discourses pleasantly and learnedly on the fish fiend piranhas, ants, and butterflies making " an ever changing kaleidoscope of colour in the moving sunlight." Fish poisoning with barbasco (*Lonchocarpus Nicou*) is also described, and he is not unnaturally puzzled as to how primitive Indians discovered the method of converting the poisonous roots of *Manihot utilissima* into a nourishing and sustaining food.

Mr. Sandeman and his companion, Mr. Michael O'Halloran, were fortunate in finding the Huallaga in a fairly good mood, though undoubtedly they were in some danger more than once owing to heavy rains and the rushing rapids—still, they probably ran greater risks in the car between Trujillo and Lima, where the road faded away into the desert and they travelled in the dark and lost their way, with a possible drop over the cliffs into the Pacific at any moment, than they did on the river or on the Cajamarca trail !

" The horror of that moment I shall never, *never* forget," declared the White King. " You *will*," replied the White Queen, " you will, though, unless you make a memorandum of it." Luckily for his readers Mr. Sandeman, though he makes light of the horrors—perils by day and by night in some of the Tambos !—has recorded fully the many moments of enchantment and extraordinary interest which he gives us the pleasure of sharing with him.

The Flora of Devon.*—A county of such great botanical interest as Devon deserves a worthy account of its flora. Jones and Kingston's pioneer work " Flora Devoniensis " (1829) was followed by T. F. Ravenshaw's List in 1860 (with Supplement in 1872). Since then no work dealing with the whole county has appeared, though studies of restricted areas, notably Archer Briggs' excellent " Flora of Plymouth," have gradually added to our knowledge of the flora.

The Devonshire Association is to be congratulated on sponsoring the present work, which will undoubtedly be welcomed on all sides as an authoritative and comprehensive account of the flora of the county.

The plan followed is that adopted by most of the larger county Floras. In addition to the enumeration of the species, there is an Introduction with sections on climate, geology, ecological studies,

* " Flora of Devon : Phanerogams, Vascular Cryptogams, Charophyta." Promoted by the Devonshire Association. Edited by Rev. W. Keble Martin, M.A., F.L.S., and Gordon T. Fraser, B.A. With the assistance of Rev. Thomas Stephenson, B.A., D.D., and Francis M. Day, M.A., F.R.Met.Soc. Printed and published by T. Buncle & Co. Ltd., Arbroath, 1939. London Agents : Wheldon & Wesley, Ltd., 2 & 3, Earnshaw St., W.C.2. Pp. xv+787, Pl. 8, Maps 2. Price 25*s*.

etc., and, at the end of the book, there are short biographical notices of botanists who have been connected with the county.

The section entitled "Southern Species in Devon" is disappointingly brief (half a page) and no mention is made of the work of Stapf or Matthews. A rather fuller analysis of the geographical affinities of the flora would have been welcome. Among the ecological studies, that on Braunton Burrows by Dr. Elliston Wright is the most valuable. It is to be hoped that the notes on the ecology of Dartmoor by G. T. Harris will stimulate the undertaking of an intensive study of this area.

In the enumeration, under each species, the localities are very fully set out, under two vice-counties, eight districts, and twenty-three sub-districts. In addition, the first record for the county, notes on taxonomy and ecological distribution, and occurrence in neighbouring counties are given. Perhaps the most valuable feature of the work is the great pains taken by the editors to use the correct classification and nomenclature of the species enumerated. The help of experts in the various groups and in nomenclature has been enlisted, with the result that the book should do much to spread a knowledge of the correct naming of British plants.

There are eight photographic plates, including pictures of several Devon rarities in their natural habitats, and two maps showing rainfall distribution and district boundaries. The book is well bound and printed and the Editors and their helpers deserve the thanks and congratulations of British botanists for this worthy addition to the County Floras of the country.

Hesperides.*—The word *Hesperides* has been used in at least two very different ways; in Greek mythology for the nymphs who guarded, with the aid of a fierce serpent, the golden apples given by Ge (Earth) to Hera (Juno), in delightful gardens at the western extremity of the world, supposed to be in the region of Mount Atlas. Thus Milton in *Paradise Regained*:

"Ladies of the Hesperides, that seem'd
Fairer than feign'd of old,"

whilst Shakespeare (*Pericles*) offended the learned by using the word in the singular:

"Before thee stands this fair Hesperides,
With golden fruit, but dangerous to be touch'd."

And it has been used in botany by Endlicher for a group of plants which included the Citrus family *Rutaceae*.

This attractive book by S. Tolkowsky, who writes his preface from Tel-Aviv, in Palestine, is concerned neither with the fair ladies nor the group of plant families, but with the various kinds of "golden apples" or Citrus fruits now to be found cultivated in most

* "Hesperides, a History of the Culture and Use of Citrus Fruits," by S. Tolkowsky. London, John Bale, Sons and Curwen, Ltd., 83–91, Great Tichfield Street, W.1, 1938. Pp. 371, with 113 plates, 10 figures in the text, and 5 statistical tables. Price 21*s*.

warm parts of the world. It is a fascinating book and deals comprehensively with an interesting and difficult subject.

From the first chapter on "The home of the genus Citrus," we learn that the first mention of Citrus fruits occurs in the *Shu-king*, popularly known as the "Book of History," a collection of old documents believed to have been edited by Confucius about 500 B.C. These documents dealt with the period from the twenty-fourth to the eighth century B.C., and amonst them there are botanical lists in which mention is made of *kü* (oranges), and *yu* (shaddocks), both of which were grown in the districts of China known at present as the provinces of Chekiang, Anhui, and Kiang-si. *Kü* is today the most common name for oranges in China. Reading this most interesting chapter and the author's concluding remarks (p. 323), it seems that the original home of the orange and citron is China, and of the lemon is either China or India, whilst the lime, the shaddock, and the grape-fruit probably came from the Malay Archipelago.

The citron (*Citrus medica*) was the first to reach the Mediterranean world, about the third century B.C., and its culture spread rapidly, chiefly owing to its employment in Jewish ritual. The orange and lemon were introduced into the same region by the Romans, and the Portuguese navigators imported improved varieties of sweet oranges. The Spaniards under Columbus planted the first oranges, lemons, citrons, and shaddocks on American soil.

It is interesting to read that Citrus fruits were at first used in Southern Europe almost exclusively in ritual and in medicine, and during the late Middle Ages they acquired considerable importance as seasoning for meat or fish. Being scarce and costly, they were used only in the households of the rich, and to the masses of the people they were not available until the latter half of the nineteenth century, when transport became more rapid. The application of cold storage brought supplies from the southern hemisphere into the market, enabling countries in the northern hemisphere to receive supplies of Citrus fruits all the year round.

The book is profusely illustrated, particularly with photographic copies of classical pictures in which citrus fruits or trees are included, the number of which is quite surprising, and a very large bibliography of books and articles in many languages concludes this intensely interesting volume. J. HUTCHINSON.

Science in the Garden.*—Sir Frederick Keeble has served a useful purpose in bringing together in book form the many articles he has contributed to the "Gardeners' Chronicle." These, as the table of contents shows, cover a wide field, opening with some useful talks on the fertility of the earth and the right ways of ensuring

* "Science Lends a Hand in the Garden," by Sir Frederick Keeble, C.B.E., F.R.S., Sc.D., F.R.S.L. Putnam, London, 1939. Pp. x+307. Price 10*s.* 6*d.*

its maintenance ; virus, fungal and insect diseases ; the effects of light and temperature on plant growth, with discourses on ultra-violet light, length of day and vernalisation experiments. On the latter subject he says nothing, unfortunately, as to whether the Russian work has been checked or confirmed in this country. Under temperature Sir Frederick refers to the eruption of Krakatoa and suggests that the plant covering was not wholly destroyed, but he can hardly have read Dr. Docters van Leeuwen's recently published and convincing account showing that the new plant covering of the island must have come from adjacent lands. With regard to the Antirrhinum rust, may it not be that the old hardy forms, which grow on walls, are resistant because they have a better constitution than the newer varieties with their beautiful and aesthetic colours ? For they, like the modern sweet peas and other " art-shade " garden plants, have been developed into remarkable colour varieties frequently at the expense of their vigour and resistance to disease ! Sections on soil sterilization and composts, forcing, and seed germination, follow naturally in his chapter " Improving on Nature," though all may not agree that the gardener, aided by scientific research, has always done so.

An interesting series of articles in the chapter " Winter and Hard Weather " is followed by sections on plant diseases and their remedies, after which comes a series of short essays on some of the recent advances in plant breeding and genetics, largely based on work carried out at the John Innes Horticultural Institution at Merton.

In the chapter " The Plant Commonwealth " many remarkable facts about the interactions of plants on one another are discussed, including the incompatibility between stock and scion and the reaction of plants to wounds. The article on the Jerusalem Artichoke in this chapter seems somewhat out of place, and one regrets there is no reference to Sir David Prain's learned explanation of the origin of the name Jerusalem, which he proved fairly conclusively has nothing to do either with the capital of Palestine or with the Italian Girasole. Articles on growth-substances, the rooting of cuttings and the effect of drugs on plants, etc., are grouped together in a chapter entitled " Oranges and Lemons," which is taken from a reference to their antiscorbutic properties in the opening article. The volume concludes with the chapter " Sermons in Stones and Good in Everything," which includes quite a number of articles hardly suggested by the title, though nevertheless of much interest.

Sir Frederick as usual writes in an easy and pleasant style and touches on a very wide range of subjects, many of which are stimulating to the amateur gardener, though many could not be properly practised on the all too brief accounts that are given.

The World of Plant Life.*—This book has been written with the specific purpose of making the layman familiar with a few of the interesting plants, both native and introduced, which are found in the United States. The author is assistant professor of botany at Colgate University, and according to his preface "any attempt to get on speaking terms with plants, whether we stay at home or travel, usually ends disastrously," because, he continues, there are too many books about them. But these contain so much detail and are written in such scientific language that the "layman with an incipient interest often shies away from these possible sources of information."

In the present bulky volume of 722 pages, therefore, the author has used a minimum of scientific terminology in order to give his readers as he says an introduction to an alive, fascinating world which is often ignored in laboratory study. And on the whole he has succeeded very well indeed, for there are illustrations to assist the reader on nearly every page, either small outline black and white drawings or full page photographs, the latter being very good. It should be noted, however, that the *baobab* and *kapok* trees do not belong to *Tiliaceae* as shown in the figures on p. 381.

The families dealt with are roughly classified into chapters, the sequence being that of Engler, though the Monocotyledons take second place. To assist the student to understand this classification, no doubt, the binding of the volume is lined both at the beginning and end with a phylogenetic "tree," at the top of which the Dicotyledons and Monocotyledons branch off separately. Most taxonomists, however, would find a better place for the "pinks," which are shown as terminating a branch bearing the willows, walnuts, oaks and mulberries. And few would now agree that the aroids, grasses and orchids should occupy a more lowly position than the lilies. These are minor points, however, due to the system followed, and are not likely to mislead the student very seriously.

Some of the information regarding the extent of certain families and genera seems to be very much out of date. For example *Ericaceae* is credited with 1400 species, and the genus *Rhododendron* with 100 species. Considering that there are 469 species of *Erica* alone described in the *Flora Capensis*, and many more besides, and between 600 and 700 fairly good species of *Rhododendron*, this estimate falls very far short of actual facts.

There are two appendices, (1) a check list of species mentioned in the book, and (2) a reference reading list of the books recommended for each chapter. It would perhaps have been an improvement if these references had been inserted with the chapters, instead of being placed together at the end of the book where they are apt to be overlooked. J. HUTCHINSON.

* By C. J. Hylander, Ph.D. The Macmillan Company, New York, 1939. Pp. 722, with numerous black and white drawings and photographs. Price 32*s.* 6*d.*

Shrubs of California.—Professor McMinn's manual* includes descriptions of "about 800 species and 200 varieties of shrubs, woody vines, subshrubs, woody cushion plants and halfshrubs" native in California. The collecting of material for the work has taken place over a period of twenty years, and more than 300 species have been transplanted to the trial gardens at Mills College, where they have been under observation for structural variations.

The sequence of families, with slight modification, is that used in Engler's 'Syllabus.' As regards the genera, it is somewhat surprising at this date to find *Mahonia* treated as a section of *Berberis*: the author mentions compound leaves and absence of spines as characters used to separate *Mahonia* from *Berberis*, but fails to note the 'intercalary' inflorescence so characteristic of the former genus.

The species-concept adopted is rather wide, forty plants described by other botanists as species being reduced to varieties, as against two varieties raised to specific rank. This method of treatment makes it possible to indicate degrees of inferred phylogenetic relationship.

The author has endeavoured to follow the International Rules of Botanical Nomenclature, and has employed double citations where they are required. Common names are supplied for each species, some of them, however, being mere translations of the scientific names. A protest seems needed against the practice, so common on the other side of the Atlantic, of citing Asa Gray and Sereno Watson as "Gray" and "Wats." respectively. Asa Gray was antedated by the well known botanists S. F. Gray (1766–1828) and J. E. Gray (1800–75), and Sereno Watson was preceded by H. C. Watson (1804–81).

There are five appendices, a glossary of botanical terms (pp. 623–630), an index to the meanings of the names (i.e., epithets) of species and varieties (pp. 631–637), a list of nomenclatorial changes made in the book (pp. 639–641), a bibliography (pp. 643–647) and a section on the use of California shrubs in the garden design (pp. 649–674). The index to the meanings of the specific and varietal names falls below the general standard of the book: *acradenius* does not mean "resembling *Acradenia*" but having glands at the apex (of the bracts in *Haplopappus acradenius*); reference to any standard Latin dictionary would have prevented the mistranslation of *consanguineus* (closely related) as "blood-colored"; the adjective *hypoleucus*, employed as a descriptive epithet in botany, does not mean "somewhat white" but white beneath (cf. the leaves of *Monardella hypoleuca*).

The manual embodies the results of many years of research, and the taxonomic views expressed in it accordingly merit careful

* "An Illustrated Manual of Californian Shrubs." By Howard E. McMinn. J. W. Stacey, San Francisco, 1939. Pp. xi+689, 775 text and full-page figures. Price $5.

consideration. The numerous reproductions of pen-and-ink drawings are satisfactory and will be very helpful, especially in difficult genera such as *Ceanothus* and *Malvastrum*. On the other hand, some of the reproductions of photographs are not all that could be desired. The text is well printed. Both author and publisher are to be congratulated on the publication of this useful and attractive volume. T. A. SPRAGUE.

Botanical Magazine.—Part 2 of vol. 162 was published on 20th October and contains the following plant portraits: *Campanula affinis* Roemer & Schultes (t. 9568), a native of the mountains of Catalonia, Valencia and Aragon, Spain; *Betula Medwediewii* Regel (t. 9569), from Mount Somlia and the neighbouring ranges of Transcaucasia; *Pedicularis megalantha* D. Don var. *Hoffmeisteri* (Klotsch) Sealy (t. 9570), with yellow flowers, a native of the Himalayas; *Eriogonum nudum* Douglas ex Benth. var. *auriculatum* (Benth.) J. P. Tracey ex Jepson (t. 9571), from central California; *Erigeron foliosus* Nutt. var. *confinis* (Howell) Jepson (t. 9572), found in California and Oregon; *Iberis Welwitschii* Boissier (t. 9573), from southern Portugal; *Genista januensis* Viviani (t. 9574) distributed from Italy to the north-western Balkan Peninsula; *Prunus campanulata* Maxim. (t. 9575), from Formosa, Liu-Kiu Islands and S. China; *Merendera sobolifera* Fischer & Meyer (t. 9576), occurring in Bulgaria and Asia Minor eastwards to Afghanistan and S. Turkestan; *Rhododendron agsatum* Balf. f. & W. W. Smith (t. 9577), native of Yunnan, and *Oncidium unguiculatum* Lindley (t. 9578), from Mexico.

A correction to plate 9545, *Jasminum polyanthum* (vol. 161, part 3) is given as follows:— *for* "A deciduous climber up to 3 metres high" *read* "A rampant evergreen climber reaching a height of 7 metres or more under favourable conditions."

Seed and Potting Composts.*—In years gone by it was a common complaint amongst practical gardeners that much of the valuable information derived from experiments carried out at the John Innes Horticultural Institution did not receive the publicity it deserved. This book, prepared with due thought after a long period of experiments, will serve to overcome this prejudice as it continues the policy adopted in more recent years of bringing to the whole of the horticultural profession the important facts obtained in research.

The older type of gardener may well consider that the methods he has adopted for so many years cannot be improved, but after reading this brief and concise work, he will be anxious to commence experimenting on his own behalf.

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* By W. J. C. Lawrence and J. Newell. Published by George Allen & Unwin, Ltd., London, 1939. Pp. 128. Illustrated. Price 3*s*. 6*d*. net.

There is no doubt that some genera will react more favourably than others to the composts advocated, and in one or two cases it would appear that there is no noticeable improvement in plants grown in the sterilised composts over those used as controls. To be positive that this is not due to other outside factors, one would require to adopt the very high standard of hygiene practised at Merton but, unfortunately, many establishments do not lend themselves to such spotless methods of cultivation.

It may be possible that some further distinction requires to be made between those composts used for plants which will be discarded at the end of one growing season and those which are of a more permanent nature. The importance of the seed compost experiments must not be overlooked, as on the assumption that a good start in life is half the battle, then the stronger the resultant seedling the more likely are the plants to grow successfully.

Though a wide range of plants has been subjected to experiment, there is still ample scope for others in the varying branches of horticulture to take up where the authors leave off and ascertain the response made to these methods by their own plants.

The subject is one of the most important of garden operations and yet has never before received the attention and study given now by Mr. Lawrence and Mr. Newell. To them are due the thanks of all gardeners interested in greenhouse management for the very capable way in which they have carried out their work and, better still, have placed the results within the reach of every person. Easily assimilated, it will prove a boon to all it reaches.

W. M. CAMPBELL.

Report of the National Botanic Gardens, Kirstenbosch.—This report for the year 1938 is pleasant reading in comparison with some of the earlier reports, since it gives welcome evidence of the growing appreciation of Kirstenbosch by the general public, and, more especially, by Government and by the Cape Town City Council. Not only did the Government make a special grant of £500, over and above the normal Government grant for 1938, but the grant in aid has been raised by a further £500, making a total of £4000 for the financial year 1939/40.

The Botanical Society as usual handed over its surplus which reached the record figure of £1067 7s. 8d.

Considerable progress has been made in the amenities of the Gardens in the way of new entrance gates, hedges and water supply.

An interesting Bell Tower commemorating the work which Sir Lionel Phillips did for so many years for the Gardens has been erected replacing one of the gate piers. The tower and the bell, formerly the ship's bell of H.M.S. " Dominion ", were given by Lady Phillips. Various other alterations and improvements to buildings are also recorded.

A change of great importance to the Gardens as regards buildings is the assumption by Government, through the Public Works Department, of the care of the buildings, both as to maintenance and erection.

For the first twenty years of the Gardens' existence new works had to be financed by special grants or by private donations. Now, thanks to the new provision, serious arrears in building have been overtaken and general improvements have been made. It should now be possible for Kirstenbosch, far more fully than before, to develop the collection, cultivation and study of the flora of South Africa.

The Grasslands of the Falkland Islands.*—This report is based on observations made by the author during a recent agrostological survey of the colony. It includes an account of the natural and artificial grasslands, together with tables showing the approximate acreage and botanical composition of the different pasture types. The climax vegetation of the Falklands is grassland in one form or another, the islands being treeless except for a few plantings made around the main settlements. In the immediate vicinity of the latter, the pastures are composed mainly of introduced species of European origin. The natural grazings, however, although similar in general appearance to the hill-lands of Wales, are dominated by non-European species. The most abundant native plant is *Cortaderia pilosa*, a grass of inferior nutritive value, which is the chief element in most plant communities.

As grassland is the mainstay of agriculture on the islands, its maintenance and possible improvement are matters of considerable importance. Chemical analyses have shown that the native grasses are in general of poor nutritive value when compared with British pasture plants. It is considered therefore that improvement in the herbage can be best brought about by the replacement of the present species by suitable introduced plants. Amongst other recommendations are suggestions for more modern management, such as the fencing and subdivision of paddocks, rotational grazing, and manuring. The periodic burning of old grass is discussed and it is pointed out that its indiscriminate use on dry ridges has caused the prevalence of an almost worthless plant—*Pernettya pumila*.

The text is accompanied by 18 photographs illustrating various types of scenery and vegetation, and by 2 maps, one showing the distribution of the chief pasture types and the other with contours plotting the routes traversed by the author in and around the islands. It is hoped that Mr. Davies' recommendations will receive serious consideration, based as they are on his expert knowledge of the treatment of the grassland problems confronting pastoralists in many parts of the world.

* By William Davies, M.Sc. Government Printer, Stanley, Falkland Islands, and Crown Agents for the Colonies, 4, Millbank, London, S.W.1. 1939. Pp. x+86. Price 5*s*.

Cultivation of Non-succulent South African Plants.*—This little booklet is a very useful guide to those whose gardening has to be carried out in conditions so greatly varied as those experienced in the Union of South Africa. The information given about plants, their habits and appearance is quite sound, as are the practical suggestions made for general cultivation. One would prefer to find the work less sub-divided, as the sudden change from descriptions of " Climbing Plants " to " Propagation by Cuttings " and then to " Pruning," as instanced on page 39, does not facilitate reference when no index is afforded.

Many plants not common in our own gardens will interest the English reader and this will, no doubt, lead to more successful cultivation in this country.

Mr. Mathews is to be congratulated on providing horticulturists with this good, practical work. W. M. CAMPBELL.

Hardy Chrysanthemums.†—This book should prove of great interest and value to all lovers of the Chrysanthemum, particularly to those who are interested in the newer and more hardy types which in recent years, with the introduction of the popular Korean varieties, are grown extensively by private and commercial growers.

In Chapter 1, which is devoted to the ancient history of the Chrysanthemum, its introduction to Europe and the development of the various new types which were raised in Europe and America, the author points out the tremendous advance made in the last quarter of a century in the raising of new types and varieties.

The various species, types and varieties are summarised and illustrated. The list of recommended varieties, which includes many of the Korean hybrids, is good, and brief notes on the habit and hardiness of each variety are given.

Cultural requirements of hardy Chrysanthemums as given in America are described in detail under various headings, including feeding, spraying and winter protection. Diseases and pests, of which the Chrysanthemum has its full share, are described, and control or preventive measures recommended in a very practical way.

In the chapter on propagation by cuttings and seeds, the author refers to the interest and fascination of raising Chrysanthemums from seeds. Information on plant breeding and hybridizing in Chrysanthemums is given in the following chapter, which should prove most helpful to the beginner.

For those interested in the raising of new Korean Chrysanthemums, the final chapters should prove valuable, for much

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* By J. W. Mathews, A.H.R.H.S. Issued under the auspices of the Botanical Society of South Africa. Published by the Speciality Press of South Africa, Ltd., Cape Town, no date [1938]. Pp. 77.

† By Alex Cumming, Jr. The McGraw-Hill Publishing Company, Ltd., London. 1939. Pp. 168. Illustrated. Price 10*s.* 6*d.*

information is given regarding the origin of the Korean Chrysanthemum and the raising of hybrid varieties.

S. A. PEARCE.

Fruit Crops.*—This book should prove a valuable addition to those already published on fruit culture, particularly to growers in this country and the colonies who require information on the methods practised in America. The authors have endeavoured to meet the needs of both the student and the grower, a point often neglected in recent books.

Information that should prove useful to the young man who intends to follow fruit growing as a career is given in the first chapter, where important points such as specialized fruit growing, capital requirements and the necessary practical qualifications are outlined.

Improvements made in varieties of fruits, the selection of bud mutations, and methods of fruit breeding are dealt with in Chapter 2. Details of the Plant Patent Law, introduced in the United States in 1930, are also given. It is interesting to note that the protection given to the raiser of a new variety is the same as that given to the inventor of a new mechanical device. This plant patent gives the raiser of a new variety the exclusive right to reproduce and sell it in the U.S.A. for a period of 17 years.

In chapters 3 and 4 the various methods of propagation are dealt with, such as cuttings, layering, budding and grafting of pome fruits, stratification, and sowing of seeds. The principles and practice of grafting are dealt with in a very practical way.

Methods of grafting, including double-grafting, are well described and illustrated, but it is surprising that the authors have neglected to mention the more recent method of " frame grafting " which is so useful as a rapid way of rejuvenating old trees. This method has, I believe, been successfully practised in America and New Zealand.

In later chapters the following aspects of the subject are dealt with: soil management, irrigation and drainage, pollination and thinning, pruning, and diseases and pests. Chapters 13 to 17 describe in detail the various individual fruit crops, and the final chapter is devoted to marketing.

The book is well illustrated and the references at the end of each chapter will greatly help the student who wishes to gain further information.

S. A. PEARCE.

Intermediate Botany.†—The first edition of this textbook was reviewed in K.B. 1936, 243, and attention was drawn to the broad cultural standpoint from which the author approached his

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* " Fruit Crops: Principles and Practices of Orchard and Small Fruit Culture." By T. J. Talbert and A. E. Murneek. Baillière, Tindall and Cox, London, 1939. Pp. 345, figs. 112. Price 19*s.*

† By L. J. F. Brimble, B.Sc., F.L.S. Second Edition. Macmillan and Co. Ltd., London, 1939. Pp. viii+562. Figs. 352. Price 8*s.* 6*d.*

subject. The opportunity of a second edition has been taken to improve the work in several ways and to add new illustrations, the excellence of which is a feature of the book.

Gardening in East Africa.*—The first edition of this book, which was published in 1934 (see K.B. 1935, 64), was sold out after two years and the editor has taken the opportunity of a second edition to add some new chapters, to rewrite a number of others and to include ten new coloured plates by Mr. and Mrs. Bally and Mrs. Graham. The new chapters include "Garden Planning," "Orchids," and "Gardening in Tanganyika Territory," and the plates, apart from the frontispiece depicting *Spathodea nilotica* by Mrs. Bally, consist of a number of subjects grouped on each plate. These improvements will be welcomed by all readers of the first edition and it is hoped that, in its new form, the book will be even more widely used.

Keys to the Phyla of Organisms.*—The object of Dr. Barkley's publication is explained in the Introduction: "The keys contained in this volume are the outgrowth of the author's effort to meet the special needs of his class in plant morphology." For this purpose it will undoubtedly prove stimulating. The author groups living organisms into four Kingdoms: *Monera*, including the colloidal first phases of life (*Archaeophyta*) and the *Schizophyta*; *Prostista*, comprising the *Thallophyta*, *Protozoa* and *Parazoa* (Sponges); *Phyta*, composed of the *Bryophyta*, *Pteridophyta* and *Spermatophyta*; and *Zooea* (*Animalia*), corresponding to the Animal Kingdom without the *Protozoa* and *Parazoa*. It is somewhat surprising to find the Sponges included in the same Kingdom as the *Thallophyta*.

The scope of the work does not admit of explanations of the classification adopted, but there is a list of 46 references which the author feels will be most useful to the student. The orders of Dicotyledons and Monocotyledons accepted seem to correspond exactly with those of Hutchinson's "Families of Flowering Plants." Their arrangement, however, differs considerably, a block of mostly perigynous or epigynous, apetalous and polypetalous orders being intercalated between the *Bicarpellatae* and the *Inferae*. Whether this reflects phylogenetic speculation or is due merely to the exigencies of the key is not apparent.

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* By Members of the Kenya Horticultural Society and of the Kenya, Uganda and Tanganyika Civil Services. Edited by A. J. Jex-Blake, M.A., M.D. (Oxon.), F.R.C.P. (London). With a Foreword by Sir Arthur W. Hill, K.C.M.G., M.A., Sc.D., F.R.S., Director of the Royal Botanic Gardens, Kew. Second Edition. Longmans, Green and Co. 1939. Pp. xiv+388. Price 12*s.* 6*d.*

* Keys to the Phyla of Organisms, including keys to the Orders of the Plant Kingdom. By Fred. A. Barkley, Montana State University. Associated Students Store, Missoula, Montana, 1939. Pp. 39. Price 75 cents, post free.

The preparation of a synoptical key to the orders must have presented great difficulties, more especially since many of them appear to be more or less artificial groups obtained by analytical methods (vide Journ. Bot. 1925, **63**, 9). The work will perhaps be more useful as an indication of the prevailing tendencies of the orders recognized than as a key to them. The *Olacales* are included under the heading " Stamens alternate with petals," although all the *Opiliaceae* and about half of the genera of *Olacaceae* (*sensu stricto*) have the stamens opposite the petals. Most of the genera of *Olacales* accordingly run down in the key to the *Rhamnales* : this might have been avoided by inserting the *Olacales* in two places in the key, but to do so would have impaired the synoptical character of the work. The *Lythrales* are included under a heading " mostly epigynous," with the result that the family *Lythraceae* runs down nowhere in the key, except for those that have a single whorl of stamens opposite the petals (e.g. *Rhynchocalyx lawsonioides*, *Diplusodon* spp.), which run down to the *Rhamnales*. It is probable that undue emphasis has been placed in the past on this single character (a whorl of stamens opposite the petals), and that the order *Rhamnales* should be restricted to the family *Rhamnaceae*. The *Vitaceae*, included in *Rhamnales* in Engler-Diels, " Syllabus," ed. 11, 273 (1936), differ from *Rhamnaceae* and approach *Simaroubaceae*, *Burseraceae* and *Meliaceae* (belonging to Hutchinson's *Rutales* and *Meliales*) in their frequently compound leaves and constantly phaenopetalous flower-buds, as well as in the anatomy of the petiole. An even stronger case exists for the exclusion of the *Heteropyxidaceae*, which—on the basis of maximum correlation of characters—seem to be correctly placed by Diels (l.c. 300) beside *Lythraceae*, along with *Crypteroniaceae* and *Sonneratiaceae*. The reasons for assigning *Elaeagnaceae* to *Rhamnales* are not obvious.

A glossary of terms is appended to assist the student in the use of the keys. *Ovary* and *ovule* are defined, the former (in botany) as an enlarged portion of the *pistil* or *gynoecium* containing ovules, but pistil and gynoecium themselves are not explained. One would have thought that they stood in at least equal need of definition. *Monosporangiate* is defined as " with one sporagium or with a single type of sporangium." Though the former meaning is etymologically correct, the use of monosporangiate in the latter sense is sanctioned by custom, but it is clearly undesirable to employ the term *bisporangiate* as equivalent to bearing two types of sporangium when the word *amphisporangiate*, proposed by Arber and Parkin, is available. The word *ovulary*, included in the glossary as an equivalent of ovary, seems superfluous : the author uses the former term on pp. 3, 4, but the latter elsewhere in the key (pp. 19–25) for precisely the same member. The term ovary is now so thoroughly established in botany that it is not likely to be replaced by the etymologically preferable word ovulary. T. A. SPRAGUE.

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